

Radio Fun

\$2.00

"The beginner's guide to the exciting world of amateur radio."

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Hams Aid in the Wake of Killer Tornadoes

Ham radio operators from throughout the South have rallied forces to aid victims of a series of devastating tornadoes that ripped through Mississippi, Tennessee and Alabama on Saturday night, November 21, 1992, and Sunday morning, November 22nd. At least 16 people were killed, with countless others injured and homeless.

All but one of the fatalities occurred in Mississippi Saturday night. At least six died when a tornado hit a trailer park in Brandon. The other reported death occurred in Toone, Tennessee.

The storm knocked out power to many homes in Rankin County, Mississippi, near Jackson. Also disrupted were many normal lines of com-

munications, including telephone and cellular telephone service. At least one 2 meter repeater was damaged and knocked off the air, but most others survived unscathed and were pressed into immediate relief operations service.

With the traditional communications services taken out, hams accompanied rescue workers who used doors from ripped-apart trailers as makeshift stretchers to move away the injured, according to a civil defense official.

In western Alabama, Danny Buford KC4RLR spent the following day in Ethelsville, which was also hit by a severe twister. Buford used his amateur radio gear to help assess damage for the Red Cross. According to

KC4RLR, he saw at least three homes that were destroyed and many house trailers damaged beyond repair. Buford said that it was all but a miracle that nobody was killed in Ethelsville, where seven people were hospitalized.

Amateurs involved in "Skywarn" severe weather spotting nets stayed on the job overnight. They were reported to have seen a tornado touch down about 11 p.m. and reported it and other critical storm information to authorities via 2 meter FM. The National Weather Service confirmed the sightings on Sunday the 22nd, noting that this help may have kept the death toll from growing higher. *Westlink Report's* Youth Editor Sam Garrett AAØCR and 1992 *Westlink*

Report Young Ham of the Year Angie Fischer KBØHXY were written up in the St. Louis, Missouri, newspapers for their participation in Skywarn operations.

Earlier Saturday, tornadoes caused serious damage and several injuries in parts of southeastern Texas. Skywarn hams also reported that a tornado touched down in southern Iowa as well, causing several minor injuries. And in Ohio, members of the Dayton Amateur Radio Association took the DARA Emergency van to a suburb of that city after a twister touched down causing minor damage on Monday November 23rd. *TNX KB4KCH, N8FPF, NØDN and others; Westlink Report, Number 639, December 10, 1992.*

Operation: Holidays II: Amateur Radio and Seasons Greetings

by Lorraine S. Matthew

N4ZCF/AAM3PR

"Happy Holidays" . . . "Seasons Greetings" . . . "Love to all" . . .

During the holiday season, millions of people the world over look forward to celebrating this joyous time of year. Millions of messages of greeting and good will are sent to friends, acquaintances, and loved ones everywhere. Does your community know that mail and telephone are not the only modes available for sending messages? In this high-tech world, you, the amateur radio operator, can offer your friends and neighbors the opportunity to send radiograms.

Operation: Holidays II is a public relations campaign which promotes the use of radiograms by the general

public. Both the National Traffic System (NTS) and MARS (Military Affiliate Radio System) are available for the sending of messages. Much of the public doesn't know that either service exists. This is where you, the amateur, can help. You are the key to helping amateur radio by educating the public. The public needs to know that both the NTS and MARS are up and running and have proved their capability of carrying messages to and from loved ones. The ultimate goal of this program is to develop such familiarity by the public with the two traffic systems that the sending of radiograms becomes a natural, ingrained habit for people everywhere.

Operation: Holidays II was launched last October. Messages and bulletins

were being circulated via the 2 meter packet system to radio clubs and amateurs all over the country. Similar information was being circulated throughout the MARS system as well. The proposal urged all amateurs and MARS members to promote the idea of having the public send radiograms (civilian to civilian) via NTS and MARS-grams (military to civilian or civilian to military) via MARS. The close cooperation between the two systems guaranteed smooth delivery, no matter what the entry point might be.

Amateurs radio clubs have an opportunity with this program to be of great service to their respective communities. Clubs usually have several traffic handling operators representing both systems. If this is not the case

with your club, find out who, in your community, does handle message traffic. Your club has the capability and the obligation to inform the public about the availability of the free and reliable services offered by amateur radio. Your club has the capability of connecting the public to the appropriate operators for service.

MARS and NTS have earned reputations for being top-notch services. Only by continuing to handle message traffic can these reputations be sustained. As you know, message handling skills are essential to the emergency capabilities of both groups. Only an informed public can generate the message traffic needed to keep traffic

Continued on page 27

Gold Digger's Mountain Shack



Here is a photo of Stephen B. Barnett KD6CNU of San Carlos, California, and his mountain shack. He spent about three months last summer in the high Sierras of California, dredging for gold. He found some gold, but says that he never finds enough.

His ICOM W2-A is plugged into a cigar lighter in the Bronco, and the RF Concepts' dual-band power amp is jumpered to the truck's battery. All of this is then fed into an MFJ J-pole.

Stephen had several good contacts but also found several repeaters that never seemed to be monitored. He was able to get into a repeater owned by the Berryessa Radio Club and, thanks to that club, was able to talk with ham friends in the San Francisco East Bay

area. The distance from his location to the repeater was about 120 miles, and from the repeater to his friends' location about 30 miles. Not bad for only about 1.5 watts! He used the power amp only a few times, when there was some electrical interference such as thunderstorms.

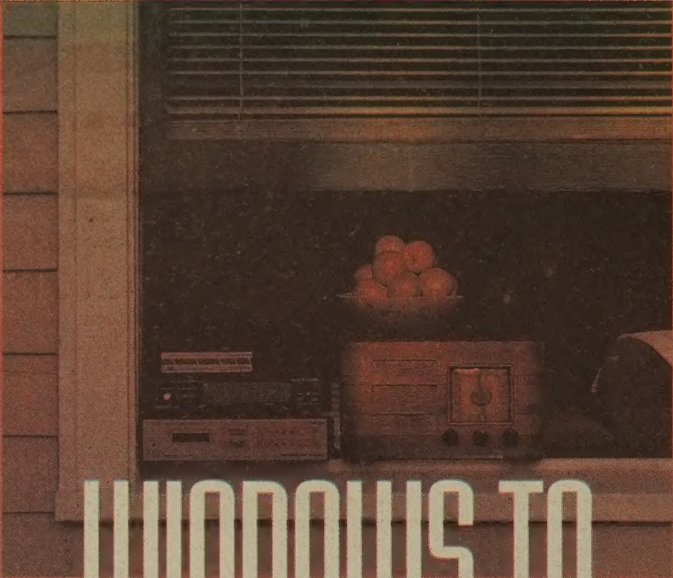

The weather was in the 90-to-100 degree range in the daytime and 40 to 70 at night. There were storms about every night, thunderstorms about twice a month.

Once a month his wife would mail him the monthly bills and magazines. He says that *Radio Fun* and *73* were VERY welcome in the evening around the Coleman lantern. They kept him abreast of what was going on in the real world.

Ban on Cellular Scanners Signed

President George Bush has signed into law legislation that blocks the sale of radio equipment used to eavesdrop on cellular telephone calls. It directs the FCC to withhold its equipment authorization for any radio scanner that can receive cellular frequencies or that can easily be modified to receive such frequencies. The equipment cannot be sold without FCC authorization.

In about a year the law will also make it illegal to manufacture this type of equipment in the United States or import any such equipment made elsewhere. *TNX N7EP; Westlink Report, Number 639, December 10, 1992.*



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Packet Scene UK—1992

by Roger J. Cooke, A.L.C.M., G3LDI @ GB7LDI

Brief History

"Packet Radio" was an unknown phrase in the UK in the mid-1980s. An article in an American magazine captured the imagination of a few UK amateurs, myself included. This, together with a description of the TNC-1 and an offer of a kit of parts, started the ball rolling. Three other local amateurs were interested: Reg G8QR, Dave G4RSP and Donny G3PMQ (now, sadly, a Silent Key). We had to import the complete kit, minus the case, for around £250. That was roughly twice what a TNC would cost to buy off the shelf now, so it was no cheap outlay. However, the units are still working, three still on the original "breadboard."

We had lots of teething problems, not the least of which was dealing with a completely new mode. The experiments we conducted on 2 meters were met with various comments, and as a result we were put in a position to be able to help others. We all found that controlling the TNC parameters was the most difficult to learn. However, that mastered, several of us ventured onto the HF bands, where we found a few packet stations on 14.103. It seems strange now to think back to 1985. I would be out on business, in my car with 2 meter FM mobile, and would receive a call from a very excited G8QR: "Hurry back home, there is a packet station on 14.103."

After spending some time trying to work different countries I came across Jack Colsen W3TMZ, who was running a completely different kind of station—a BBS. Jack and I became very good friends and in early 1986 he brought me a Xerox 820. I obtained a pair of 8" disk drives and started running a BBS myself on HF and VHF.

I had to buy another TNC, the PacComm 200, for HF. The real-time gateway facility was a novel feature which could be used, in those days, with little other traffic around. In fact, at one stage John A4XZL, who was stationed in the RAF out in Oman, connected to my BBS on 21 MHz, digipeated down to Cambridge, 60 miles to my south, and chatted to a friend of his. I doubt if that would be possible or even advisable now!

The packet explosion had begun. We began to find other small groups around the country in about the same state of development. In order to contact them and pass mail around, repeaters were set up and other amateurs began to run BBSs. Strangely enough, I was still the only one running an HF packet BBS. Even to this day there are only about three other HF gateways operational in the UK. However, that seems to be quite enough, as I can handle most of the traffic that comes through both ports. It is estimated that about one in three UK amateurs is now active on packet radio. We are not quite so fortunate as USA amateurs: Our VHF/UHF bands are just about half the size so we are restricted to a very small number of channels in comparison.

Present Rules, Regulations and Permitted Frequencies

There are three categories of permitted operation: Attended Operation, Unattended Operation, and Mailbox Operation.

Attended Operation: The UK amateur license permits attended operation on all bands. This includes the operation of cross-frequency/cross-band nodes. Any port that is not cleared for unattended operation—either gen-

erally, under the terms of the license, or formally site-cleared by the Radiocommunications Agency (RA) of the DTI (Department of Trade and Industry)—must be turned off when the station is unattended.

Attended operation is defined as operation where the licensed operator is in control of the station and the equipment can be switched off IMMEDIATELY on receiving a request to do so.

Unattended Operation: The UK Amateur License permits operation on an unattended basis (excluding mailbox operation) on the following bands:

50	—	51	MHz
144	—	146	MHz
1299	—	1300	MHz
2310	—	2450	MHz
3400	—	3475	MHz
5650	—	5680	MHz
5755	—	5765	MHz
5820	—	5855	MHz
10000	—	10250	MHz
10270	—	10300	MHz
10400	—	10500	MHz
24000	—	24050	MHz

The following frequencies are the packet bandplan at present:

50 MHz	
50.61 MHz	DX Packet Cluster access channel
50.63 MHz	Network access
50.65 MHz	Mailbox user access
50.67 MHz	DX and simplex operation
50.69 MHz	Network use
50.71 MHz	Specific application, e.g. TCP/IP
50.73 MHz	Not used. Guard channel for 9.6K baud
50.75 MHz	9.6K baud use
70 MHz	
70.3125 MHz	Network use

70.3250 MHz	DX packet cluster access channel
70.3375 MHz	Mailbox and network access, user channel
70.4875 MHz	Network use
144 MHz	
144.625 MHz	Simplex working or TCP/IP use
144.650 MHz	Network and mailbox, plus user access
144.675 MHz	Simplex working
432 MHz	
430.625 MHz	Network use
430.675 MHz	Network use
430.750 MHz	Network use
432.625 MHz	Reserved
432.650 MHz	9.6K baud mailbox and user access
432.675 MHz	Mailbox and user access
433.625 MHz	DX packet cluster user access
433.650 MHz	Network use
433.675 MHz	Simplex working
433.725 MHz	Duplex channel
439.425 MHz	Network use
439.575 MHz	Simplex or duplex with above duplex channel
439.725 MHz	Simplex or duplex with above duplex channel
439.825 MHz	Simplex or duplex with above duplex channel

1.3 GHz	
1240.150 MHz	150 kHz network channel
1240.300 MHz	150 kHz network channel
1240.450 MHz	150 kHz network channel
1240.600 MHz	150 kHz network channel
1240.750 MHz	150 kHz network channel
1299.000 MHz	25 kHz channel
1299.425 MHz	150 kHz channel
1299.575 MHz	150 kHz channel
1299.725 MHz	150 kHz channel

As you can see from the above list, our 2 meter limitations severely curtail the networking capabilities of that band. Overcrowding has obvi-

ously added to the problem, with most users obtaining only 2 meter equipment. However, with the release of several channels on the 70cm band it is hoped that we can spread the load somewhat from both the user's and the network's point of view. Also, there are several high-speed (9.6K baud) links on the 23cm band, mostly used for forwarding/networking. Some groups are now experimenting with 56/64K baud, and there is one dedicated link already working at 56K baud. This will expand as equipment/funds allow.

Setting up high-speed links is a very expensive exercise when the modem, TNC, antenna and transceiver are all added together. As an amateur network, I think that we do quite a reasonable job. A suitable site has to be found, and paid for; the equipment has to be maintained, electricity provided and antennas mounted. To cover these sorts of expenses, various groups have formed all over the UK, each with several members paying their annual fees. The Norfolk AX25 Group is no exception and we have about 30 members locally. To help subsidize our expenses we have an annual barbecue which is run at a small profit but essentially to provide a family day out. This sort of event is quite well supported and always takes place on the last Sunday in June.

The sidebar shows the number of BBSs active at the present time. The full hierarchical addressing should be used if sending mail to the UK. If you are sending mail to the UK and are not sure of the full address, just refer to a map and send it to the nearest BBS on the list. Even if you do not get it right first time, White Pages will find him from there. However, to send mail into the UK blind with an address which consists of only the recipient's call-sign, is like aiming for the waste bin!

Forwarding Scene

My forwarding BBS, GB7LDI, is active 24 hours a day, both on VHF at 144.650 and on HF with the following schedule:

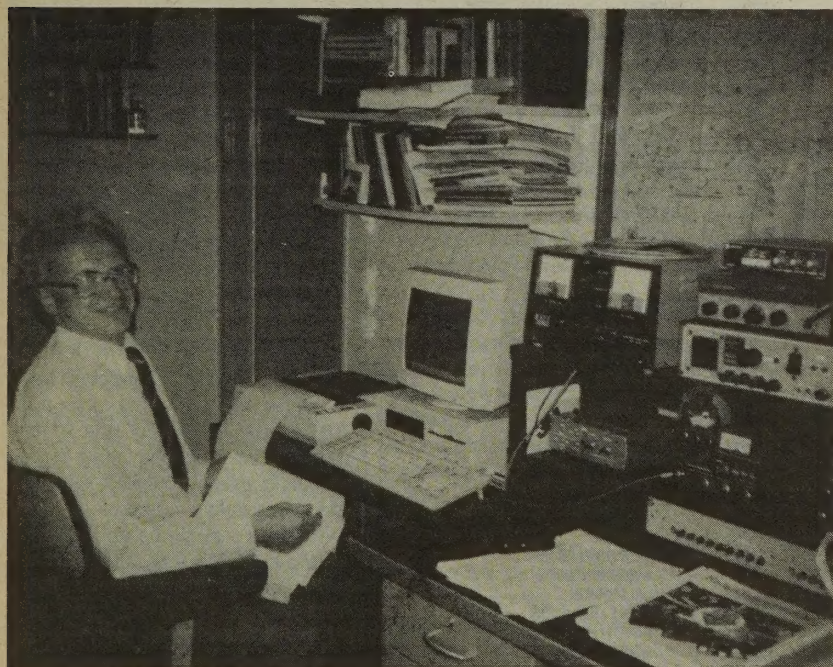


Photo A. A famous guest in the shack of G3LDI: Leo UA3CR spent a day with me looking at my packet gear, printing out lots of files and putting the information to good use when he arrived home. I now forward with Leo on 21.105 MHz regularly.



Photo B. Jack Colsen W3TMZ who is also heavily involved with AMSAT NA. Jack was responsible for starting G3LDI on HF packet several years ago and is his present forwarding partner on 21/14MHz.

**0800—1300 21.105 MHz LSB
beaming east:**

Forwarding mail to SV1IW plus bulletins.

Mail to/from Europe, Asia, Oceania, Australasia, Far East and Africa.

Forwarding mail to 4X1RU, plus bulletins to/from USA ARRL and AMSAT.

Mail to Middle East, part Europe, and others overlapping SV1IW.

Reverse forwarding to UA3CR, TF3KB, SM5BKI, I1HUH, YB1BBS, plus several others.

**1300-2000 21.099.6MHz beam-
ing west:**

Forwarding mail to WA3TAI.

Mail to/from USA, Canada, South America and the Caribbean. This time slot is dependent upon propagation and may well be put onto 14.098.1 and left there until 0800.

I hope to have my autoQSY program working soon, so HF will be almost automatic.

Another active HF station is Chris, GU4YMV operating GB7GUR in Guernsey. His schedule is as follows (times and frequencies unknown):

OZ5BBS All EU mail and bulletins.

F6ABJ All mail to France.
IK4BLV All EU mail plus USA mail and bulletins.
LA6CU Scandinavia and Germany.
LA6HX Scandinavia and Germany.
EA4DYX All EA SV1IW SV and 4X.

Chris operates on 14 and 3.5 MHz.
Dave G3VOM operates GB7GMX in Swinton, Manchester. Dave is active on 14.109 MHz and forwards with SV1IW and several other European stations.

Equipment Used

When packet first started in the UK in the mid-1980s, the computer equipment was mostly the BBCB, Spectrum, VIC-20, 32kb of RAM, and a disk drive if you were lucky. Times have changed. We have all invested a vast fortune in computing power. I now run a PC clone, a 386SX with 4mb RAM, 130mb hard drive, 5.25 and 3.5 floppies, EGA monitor, running 24 hours per day. The expansion slots are equipped with two DRSI cards, plus a Kansas City Tracker card for a satellite gate-

way I hope to be running soon. Most sysops run at least an XT, a lot have 386 machines, a few have 486 machines with super VGA monitors. The software varies from the MBL and RLI, old faithfuls, to newer and more sophisticated packages, such as the F6FBB with its satellite file-server, a very popular HF BBS program, and MSYS with its DX Cluster and node built in. Locally in Norfolk, the sysops have just changed to G1NNA BBS software, fronted by the world-famous G8BPQ node software. This has built-in mail compression which does save a lot of time and frustration for the users on 2 meters, as BBSs have to share the one frequency with nodes, repeaters and users. It really is chaos sometimes!

It would be a great idea if all BBS authors pooled their ideas and came up with a common package incorporating the good ideas of each. However, I suppose that would destroy the individuality and writing incentives.

As far as users are concerned, there are quite a few terminal programs available, but the most popular by far seems to be LanLink, written by

Joe Kasser G3ZCZ, now living in Silver Spring, Maryland.

Bandplan

Having evolved thus far, a listen on 14 MHz will show how crowded the data segment has become. The RSGB, in their wisdom, have decided that packet is still "an experiment." Therefore, ALL data modes are relegated to the top 20K Hz of each band, mixing it with RTTY and AMTOR. Unfortunately, these modes do NOT happily coexist and as such should have segments of their own. Needless to say, it is becoming almost impossible to exchange mail with WA3TAI on 14 MHz, even though I have a three-element beam at 100 feet. Tom has a stacked array and the only way we can exchange successfully is by driving the competition away by using our linears! This is NOT an acceptable solution—we desperately need an international bandplan agreement, even if it means putting packet at the top end of each band in a 20 kHz segment. Each data mode should be treated in the same way because they are growing in popularity, not diminishing,

as some would hope.

To this end, I have submitted a paper to the IARU for discussion regarding bandplans and am ever hopeful that some action will be taken. I think at least the penny has now dropped and it has been recognized that action of some sort has to be taken, although it takes a long time for bureaucracy to work! However, it needs agreement not only in Region 1 but in ALL IARU regions, so hopefully some support will be forthcoming from the North American continent for such a plan.

The Future

Used properly, packet radio has quite a rosy future, with lots of packet now coming down to the earth from space, with *Mir* and the Microsats quite active on this mode. As I am writing this, I am tracking *Mir* and listening to the end-stop signal on 145.550 MHz, sometimes on FM, but mostly on packet. I have almost completed my satellite gateway, which should be forwarding mail at 9.6K baud very soon. There is one station already active in the UK: GB7LAN in Lancaster, operated by Andrew Sellers G8TZJ. It is hoped to have three in the UK, the other one being located in the southwest of the country. This should give adequate coverage for the whole of the UK.

Even so, checking into the AMSAT skeds, it is obvious that the satellites themselves are becoming so popular that it is difficult to exchange traffic. What we really need is a set of geostationary satellites giving full coverage of the earth with about 250 watts of downlink and 500 kHz or 1 MHz of bandwidth using all modes. Well, it's nice to dream!

Visit to USA

Having outlived the gamble with the life insurance company, I took my two descendants, Robert, 18, and Louise, 22, on a holiday for our first visit to the USA and Canada in 1991. We had a fabulous time and stayed with amateur friends for three weeks out of the four.

Having had the chance to sample packet on the USA/Canada side of the pond, I can see why the network there works so much better, with the added bandwidth of both 2 meters and 70cm. However, given time and a lot of persuasion, perhaps we can obtain a few more channels on those two bands. This would undoubtedly help with our problems. Giving a talk at the Victoria Amateur Radio Packet Association meeting, I caused a great deal of mirth with my description of the legal niceties that we have to adhere to when trying to set up a BBS or repeater. It is not quite so funny when one is on the waiting list for months or even a couple of years before being able to operate!

I write a regular monthly column in *Practical Wireless* called "Packet Panorama," covering all aspects of packet radio. News, items of interest, photographs, etc. are always welcome. Items from abroad are always welcomed by the readers, if only to confirm that the same sort of problems exist, in some form or another, in other parts of the world.

RF

County Legends in Callsign Order

BBS Call	County Code	BBS Call	County Code	BBS Call	County Code
EI1DF	IRL	GB7DUG	ESX	GB7LIV	MSY
EI3EG	IRL	GB7DXC	GLR	GB7LNX	LCN
EI4LRC	IRL	GB7DXH	HFD	GB7LRG	LEC
EI5CI	IRL	GB7DXI	BRK	GB7LRS	LEC
EI6EH	IRL	GB7DXM	SFK	GB7LTN	DYS
GB3KP	LDN	GB7DXS	SWX	GB7LWB	NHM
GB3UP	SRV	GB7EBN	SXE	GB7MAC	SCD
GB3XP	LDN	GB7EDN	LTH	GB7MAX	WMD
GB7ABB	GDD	GB7EMX	GRN	GB7MDX	CHS
GB7ABC	CWD	GB7EMS	SWX	GB7MHD	CBE
GB7AKJ	DVN	GB7ESX	ESX	GB7MRU	YSS
GB7AOB	HLD	GB7EYM	YSN	GB7MSW	HFD
GB7APC	BRK	GB7FBH	DVN	GB7MXM	SFK
GB7AWA	TYS	GB7FCI	LNH	GB7NCL	TWR
GB7BAD	NOT	GB7FLG	LEC	GB7NEM	CVE
GB7BBS	SPE	GB7FYS	YSW	GB7NES	GRN
GB7BBY	HBS	GB7GBY	HBS	GB7NNA	ESX
GB7BEN	BKS	GB7GHU	LDN	GB7NOS	HLD
GB7BEQ	BRK	GB7GLP	DVN	GB7NOT	NOT
GB7BEV	MCH	GB7GMX	MCH	GB7NRC	LEC
GB7BIL	NHM	GB7GUN	SOM	GB7NRY	YSW
GB7BIR	WMD	GB7GUR	GUR	GB7NUN	WKS
GB7BMX	NLD	GB7HAS	SXE	GB7NWP	MCH
GB7BNI	ATM	GB7HFF	SCD	GB7OAR	MSY
GB7BNM	DOR	GB7HHH	HFD	GB7OMM	KNT
GB7BPQ	NOT	GB7HIU	LDN	GB7OXF	OFE
GB7BPT	CBA	GB7HJP	HPH	GB7PDX	DVN
GB7BST	LDN	GB7HMI	DWN	GB7WRG	CBA
GB7BSX	YSS	GB7HMZ	DYS	GB7PET	CBE
GB7CAM	CVE	GB7HSN	LDN	GB7PLX	HPH
GB7CFB	SFK	GB7HXA	CBE	GB7PLY	DVN
GB7CHS	CHS	GB7IMB	AVN	GB7PMB	SPE
GB7CPG	CNL	GB7JAN	MCH	GB7PWY	LNH
GB7CQV	GRN	GB7JED	BDS	GB7PZT	HWR
GB7CRG	CHS	GB7JSC	SCD	GB7RBY	WKS
GB7CYM	YSW	GB7KAW	CNL	GB7RDG	BRK
GB7DAA	HFD	GB7KEV	YSN	GB7RMN	NOR
GB7DDX	CBE	GB7KHV	BFD	GB7SAM	SFD
GB7DGL	LDN	GB7KLY	YSW	GB7SAN	SCD
GB7DNS	ESX	GB7LAN	LNH	GB7SAT	LDN
GB7DOI	GNM	GB7LDI	NOR	GB7SCA	DVN
GB7DOR	SRV	GB7LDS	YSW	GB7SDC	LEC

The calls of the BBS are followed by the three letter county code. This will enable mail to be targeted quite accurately even if the home BBS of a station is not known.

British County Legends in County Order

County	Legend	County	Legend
ANTRIM	ATM	ISLE OF WIGHT	IOW
ARMAGH	ARM	ISLES OF SCILLY	IOS
AVON	AVN	JERSEY	JER
BEDFORDSHIRE	BFD	KENT	KNT
BERKSHIRE	BRK	LANCASHIRE	LNH
BORDERS	BDS	LEICESTERSHIRE	LEC
BUCKINGHAMSHIRE	BKS	LINCOLNSHIRE	LCN
CAMBRIDGESHIRE	CBE	LONDON DERRY	LDR
CENTRAL	CTR	LOTHIAN	LTH
CHESHIRE	CHS	MERSEYSIDE	MSY
CLEVELAND	CVE	MID GLAMORGAN	GNM
CLWYD	CWD	NORFOLK	NOR
CORNWALL	CNL	NORTH YORKSHIRE	YSN
CUMBRIA	CBA	NORTHAMPTONSHIRE	NHM
DERBYSHIRE	DYS	NORTHUMBERLAND	NLD
DEVON	DVN	NOTTINGHAMSHIRE	NOT
DORSET	DOR	ORKNEY ISLES	OKE
DOWN	DWN	OXFORDSHIRE	OFE
DUMFRIES & GALLOWAY	DGL	POWYS	PWS
DURHAM	DHM	SHEPHERD ISLES	SLD
DYFED	DFD	SHROPSHIRE	SPE
EAST SUSSEX	SXE	SOMERSET	SOM
EIRE	IRL	SOUTH GLAMORGAN	GNS
ESSEX	ESX	SOUTH YORKSHIRE	YSN
FERMANAGH	FMH	STAFFORDSHIRE	SFD
FIFE	FFE	STRATHCLYDE	SCD
GLOUCESTERSHIRE	GLR	SUFFOLK	SFK
GRAMPIAN	GRN	SURREY	SRV
GREATER LONDON	LDN	TAYSIDE	TYS
GREATER MANCHESTER	MCH	TYNE & WEAR	TWR
GUERNSEY	GUR	TYRONE	TYR
GWENT	GWT	WARWICKSHIRE	WKS
GWYNEDD	GDD	WEST GLAMORGAN	GNW
HAMPSHIRE	HPH	WEST MIDLANDS	WMD
HEREFORD & WORCESTER	HFD	WEST SUSSEX	SWX
HERTFORDSHIRE	HFD	WEST YORKSHIRE	YSW
HIGHLAND	HLD	WESTERN ISLES	WIL
HUMBERSIDE	HBS	WILTSHIRE	WLT
ISLE OF MAN	IOM		

British County Legends in Legend Order

Legend	County	Legend	County	Legend	County
ARM	ARMAGH	IOW	ISLE OF WIGHT	ESX	ESSEX
ATM	ANTRIM	IRL	EIRE	FFE	FIFE
AVN	AVON	JER	JERSEY	FMH	FERMANAGH
BDS	BORDERS	KNT	KENT	GDD	GWYNEDD
BFD	BEDFORDSHIRE	LCN	LINCOLNSHIRE	GLR	GLOUCESTERSHIRE
BK	BUCKINGHAMSHIRE	LDN	GREATER LONDON	GNM	MID GLAMORGAN
BRK	BERKSHIRE	LDR	LONDON DERRY	GNS	SOUTH GLAMORGAN
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CVE	CLEVELAND	NHM	NORTHAMPTONSHIRE	HFD	HERTFORDSHIRE
CWD	CLWYD	NLD	NORTHUMBERLAND	HLD	HIGHLAND
DFD	DYFED	NOR	NORFOLK	HPH	HAMPSHIRE
DGL	DUMFRIES & GALLOWAY	NOT	NOTTINGHAMSHIRE	HWR	HEREFORD & WORCESTER
DHM	DURHAM	OFE	OXFORDSHIRE	IOM	ISLE OF MAN
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DVN	DEVON	PWS	POWYS		
DWN	DOWN	SCD	STRATHCLYDE		
DYS	DERBYSHIRE	SFD	STAFFORDSHIRE		

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Radio Fun

FEBRUARY 1993
issue #19

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RADIO FUN (ISSN 1055-887X) is published monthly by Radio Fun, a division of Wayne Green, Inc., 70 Route 202-N, Peterborough NH 03458. Subscriptions: \$14.00 per year. Canada add \$8.00. Foreign add \$12.00 surface/\$32.00 airmail. Second class postage pending at Peterborough NH and additional mailing offices.

POSTMASTER: Send address corrections to RADIO FUN, P.O. Box 4926, Manchester NH 03108.

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letters



Write to: Radio Fun, 70 Route 202-N, Peterborough, NH 03458

Bob and Rich Howard, Longmont CO I just wanted to send you a note to tell you what a help *73 Amateur Radio Today* and *Radio Fun* have been to my son and me. It all started in September when my son Richard and his buddy went to a hamfest to look at CB gear. They met and talked to a local ham and their interest was piqued. My son came home all enthused about learning amateur radio.

We used the Reader Service cards in your magazines to obtain information on equipment from your advertisers. The advertisers we called for even more detailed information were very helpful. As of right now, we have purchased over a thousand dollars worth of equipment from them and will probably double that within the next couple of months.

My son and I have joined the Longmont Amateur Radio Club and have both passed our license exams. I have passed full Technician and Rich has passed the No-Code Tech and is still working on passing the code exam. We are working with two of his friends to get them through Novice or No-Code Tech also.

Thanks for being such a great help and source of information for us. We would never have gotten this far as fast as we did, without you and your advertisers.

Bob and Rich—Thanks for all your kind words about 73 and Radio Fun, and thanks also for letting our advertisers know that you're a 73/RF reader. Advertisers really do listen to their customers, and the best way you can help us bring you bigger and better publications is to let the advertisers know which magazines you read.

Though you don't mention your son's age, your letter brings up a great part of amateur radio that too often gets overlooked: Ham radio is a great hobby for parents and children to share. In this day of single parents or households where both parents work, it gets harder and harder for parents to find the time and energy to spend with their kids. After a long day at work, and with a weekend full of chores, spending time with your children often falls into the "I know I should, but" category. A hobby like amateur radio is perfect for building bonds that will last a lifetime.—David N1GPH

Grady W. Eaton KD4CEE, Milton FL I cannot hold back any longer. I must reply to the letter you received from a petty officer first class in Uncle Sam's Navy (October 1992). First of all, if I were in charge I would look favorably on an ET1 who held a ham license. It sort of goes together like grits and gravy.

I spent a few years (23) in Uncle Sam's cruise service and my rate was a far cry from the electronics field. Sure, every once in awhile I could remember P-I-E and E-I-R, but that was it. So, I can't drum up a whole bunch of sympathy for a person in the electronics field having some problems with obtaining a ham license. An ET1 is in a most advantageous position to

engage in this hobby.

I continue today to work in my Navy rating with a hammer, cold chisel and a good pair of pliers (aircraft mechanic). Each day going to work I pass, and become envious of, three great big towers with all sorts of antenna wire strung between them and some beams and verticals, etc. I know that they all aren't TV antennas. The sign says "Ground Electronics." I'm sure the place is full of ETs. So write the ARRL for more information. You don't know what you're missing.

George Therien, North Providence RI My first radio sent by common carrier was damaged when I sent it to a repair facility. The carrier's insurance refused the claim, saying that the radio wasn't packaged properly.

I've overcome that problem by using spray foam insulation as packaging material.

The way to do it is to get a box about four inches bigger than the radio. I spray about two inches of foam into the box. THEN place the radio in a plastic bag and set it into the foam. I place another bag over the radio and spray the foam over the top of the radio and down the sides about two inches. I then let it set for 24 hours. After that it's ready to seal and ship to the repair facility.

George—Thanks for the tip. We should also remind everyone that it's always a good idea to save the original box(es) your gear was packed in. Place the item in the original box, with all of the original packing material, then place it in a larger box with more packing foam or some of the stuff George uses. That should ensure that your equipment gets to where it's going in one piece.—David N1GPH

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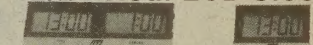
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Radio Fun

FEBRUARY 1993 5

Refrigerant Pipe J-Pole

Too easy to be true!

by Dave Curtis NGØX

This J-pole is a simple, cheap, quick-to-build and unobtrusive antenna for the 2 meter band. When I moved into my new town house, making a little racket on packet was my first ham radio priority. There were two problems I needed to solve to get RF into the air. First, the association covenants for my new QTH allow antennas (thankfully!), but only those that cannot be seen from ground level in front of the complex. That meant that a small, unobtrusive skyhook was the order of the day. Secondly, cash outlays had to be kept to a bare minimum. (Alas, the new town house came with a new mortgage.) This J-pole is small and skinny and very frugal. Build one—you'll like it.

What's a J-Pole?

A J-pole is a vertical half-wave dipole, end-fed through an impedance-matching stub. This may not be obvious the first time you see one because mechanically all of the pieces run together. In fact, in this design both the antenna and the matching section are made of one continuous piece of copper pipe.

Here's how a J-pole works (see Figure 1): The top two-thirds of the antenna are a simple half-wave dipole, radiating a vertically polarized signal because of its vertical orientation. Because it is one-half wavelength, there is no need for ground plane spokes of any kind. The catch

is that since the dipole is being fed from the end rather than from the middle, it presents a very high impedance to the feedline. That's where the bottom one-third of the J-pole comes in—it is really a transmission line one-quarter wavelength long. This section of transmission line acts as a transformer, changing the high impedance of the end-fed dipole into an impedance that will match the coax.

Oh, there is just one more catch: The transmission line transformer is a balanced feedline, and in order to hook up with an unbalanced coaxial feedline you need a balun. One of the simplest and cheapest balun designs for frequencies in the VHF range is the coaxial loop balun. All it takes to build one is an electrical half-wavelength of coax and a little solder.

Design

With most antennas, deciding the electrical configuration and calculating critical dimensions are only the beginning. Sound mechanical design is what makes an antenna successful—and the simpler the better. In my J-pole, the dipole and transformer line are made out of one continuous piece of 3/8-inch copper refrigeration tubing. Refrigeration tubing comes in several sizes; 3/8-inch seemed to be a good compromise between workability and rigidity. The local home improvement center sells it for 69 cents per foot.

For the support structure, I used that good old standby, PVC plumbing. Where would hams be without plastic pipe? A 10-foot length of 3/4-inch pipe cost me under a buck. Easy to work, with reasonably good insulation properties, PVC pipe has to be the eighth wonder of the ham world!

A few feet of pipe and three T-joints built a support that fit the low profile requirements of my installation. Figure 2 shows my support design. The antenna element is attached to the support by machine screws in three places: one screw at the bottom center of the transformer section, and two at the other end of the transformer section. Feel free to improvise what you need to fit your installation. The main goal is to hold the transformer section secure, maintaining even spacing. Just about any support that fits your situation will work as long as it is mechanically sound and is insulated from the antenna.

Construction

Since I built this antenna for packet, the dimensions shown are for a design frequency of 145.0 MHz. For other frequencies, calculate your own dimensions using the formulas shown in Figure 1. Grab a permanent mark-

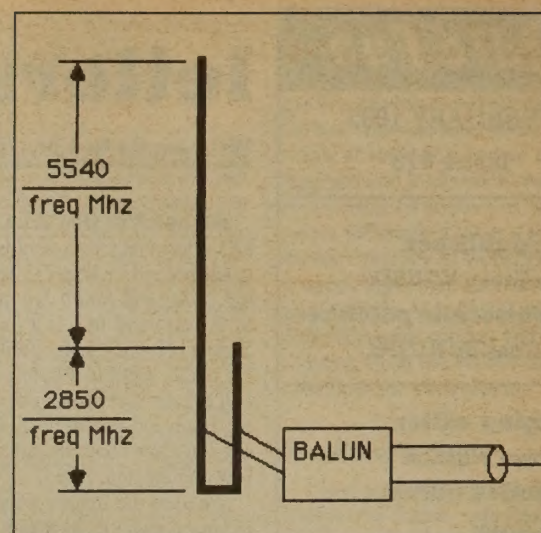


Figure 1. Basic J-pole dimensions.

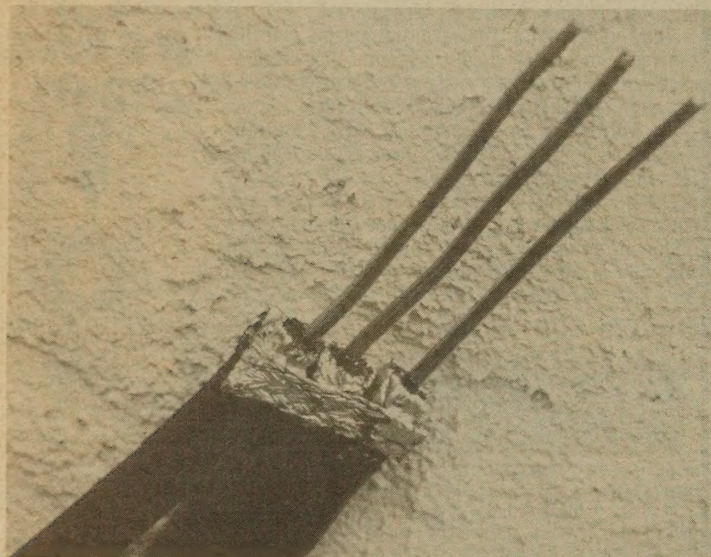


Photo A. Short all three braids together.

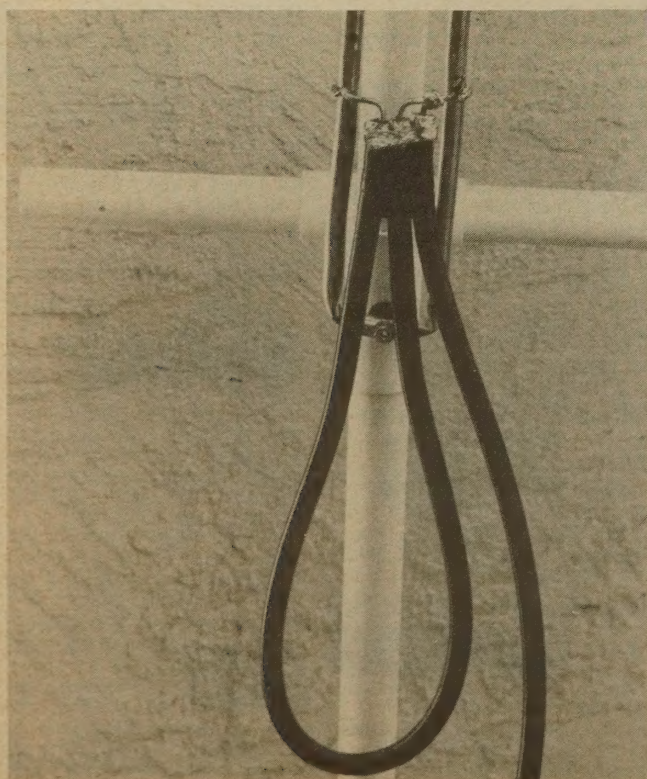


Photo B. Feedline attachment.

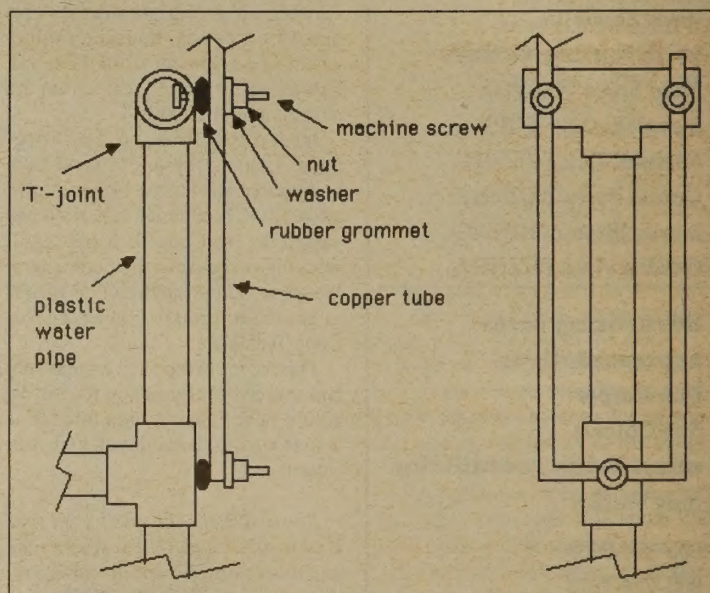


Figure 2. Rough sketch of support structure (not to scale).

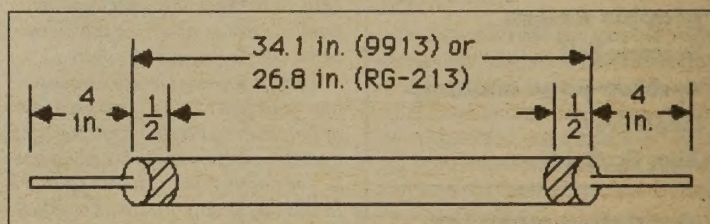


Figure 3. Balun dimensions for 145.0 MHz.

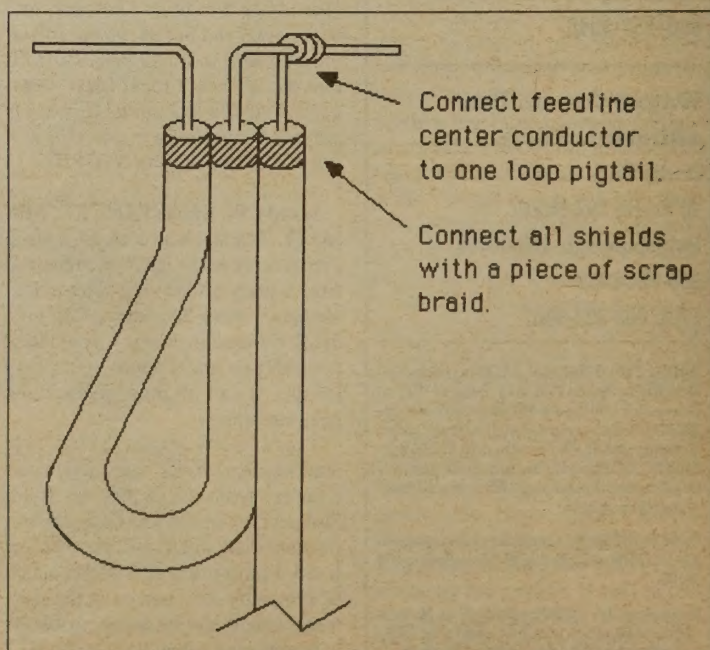


Figure 4. Balun assembly.

er that will write on copper, then lay out your measurements on the copper tube. Put a mark at one-quarter wavelength, then put a mark three inches farther up to allow for the stub end, then measure another three-quarter wavelength and mark the top. Cut off the tube at your top mark.

Bend the tube at the stub marks, forming the antenna into its characteristic "J" shape. Without tube-bending tools you will squash the corners a bit, but that's OK—the electrons don't mind. Don't worry if your spacing is not exactly the same as mine. It will make a difference in the exact impedance of the transmission line, but the differences will be tuned out anyway, so the exact number doesn't matter. Just make sure that your support holds the two sides of the transmission line parallel. Drill holes to fit your support, then mount the antenna.

A J-pole needs a balanced feed, so some kind of balun is required to mate to coax. The simplest way to go for a 2 meter antenna is a coaxial cable loop balun. The loop is made of an electrical half wavelength of coax, which is shorter than the free-space half-wave formula because the wave travels more slowly in coax. The actual speed is expressed as a velocity factor, which is the fraction of the free space speed of light that waves travel in the coax. The velocity factor depends mainly on the insulator used in the coax. For RG-213, the velocity factor is 0.66; for Belden 9913 (which I used), it is 0.84, so my loop is $(0.84)(5892/145.0 \text{ MHz})$, or 34-1/8 inches.

Cut the loop as shown in Figure 3. When you strip the ends, save the braid scraps. They will be used to make the loop braid connections. Prepare the end of your feedline by stripping back the braid and dielectric as you did for the loop. Tin the braids of all three prepared coax ends. Flatten two scraps of braid, then tin them. Form the loop into a "U" shape, shorting the braids at each end together and making the pigtailed parallel. Lay the feedline alongside in parallel; its braid should short the loop braid. Use the tinned braid scraps to short the three coax braids and solder them together as shown in Photo A. Bend the loop pigtailed out to opposite sides, forming a "T." One loop pigtail will cross over the feedline pigtail. Wrap the feedline pigtail around it a couple of times, trim off the excess, and solder as shown in Figure 4. This is a good time to get out your ohmmeter and make sure that the center conductor has not been accidentally shorted to the braid by excess heat or other mishaps.

After you've completed the balun, it's time to tune up. J-poles are dead easy to tune if you have an SWR meter. The matching section that forms the bottom third of your antenna is an impedance transformer that gives you any impedance you want. At the top end, where it joins the half-wave antenna section, it has a very high impedance. At the bottom end, it is shorted (zero impedance). Somewhere in between is the sweet spot that exactly matches your feedline. You can easily find it by looking for a low SWR.

Insert your SWR meter close to the antenna. Scrounge a couple of plastic spring clamps or some equiv-

alent nonconductive device to temporarily hold the balun's pigtailed to the J-pole. You want to get good contact while making test transmissions. Start four inches up from the bottom and search for a spot that gives you low SWR. (Don't transmit while moving the taps!) You should be able

to get very close to 1:1. Mark the tap points.

Every good solder joint starts with a good mechanical connection, so drill holes at your tap points to accept the balun's pigtailed. Pass the pigtailed through, twist them back, then solder. See Photo B. Strap the







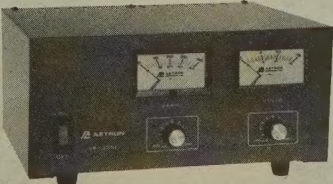

coax to the support with cable ties or electrical tape, then give the antenna one final test. At this point it's all ready to go except for one thing: The coax ends should be moisture-proofed. The simplest way is to goop some coax connector sealant onto the ends.

Put it Up!

Hey! It's ready to go up in the air! And what did it cost? Five bucks for copper tube, three for plastic pipe and fittings, plus a few cents for miscellaneous screws and solder and so forth, and that's it. Definitely a competitive dollar-per-dB ratio. **RF**

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*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

CIRCLE 16 ON READER SERVICE CARD

Hawaiian Hams Respond to Iniki Devastation

by Ann Shaver AH6KY

Before the Civil Defense sirens began wailing to alert the public to the approach of Hurricane Iniki, Wayne Jones NH6GJ, Hart Akagi KH6BJO, and other members of Honolulu's Emergency Amateur Radio Club (EARC) knew they would be able to handle whatever nasty surprises the storm might throw them. "After all," Jones remarked, "we have fun but we take Field Day seriously."

The Category 4 hurricane had flirted with the Hawaiian Islands for several days. After taking a turn away from the state on Tuesday, Iniki gathered strength, changed course and on Thursday night headed toward Oahu, the most populous of the eight major islands. That was when Jones, President of EARC and

County RACES (Radio Amateur Civil Emergency Service) Coordinator, Robin Liu AH6CP, trustee of the State RACES repeater system, and other volunteers headed to the command post in the basement of Honolulu Hale (City Hall). Numerous other amateur groups and unaffiliated hams pitched in to do what they could to lessen the suffering before, during and after the storm, which damaged Oahu's Waianae Coast and devastated the neighboring island of Kauai.

"We're well organized here at Navy MARS," explained William Boykin W6HTH. "As soon as we learned Iniki was heading our way, we followed our procedure and established our emer-

gency net. Each of us knew whom to call and what to do." Almost incredibly (but then, that's part of what amateur radio is all about!), John Porter NH6TL continued participating in the net while the storm raged at his Kapaa, Kauai, QTH.

"It may sound trite," half-apologized Pat Corrigan KH6DD, a State Civil Defense leader, "but we amateurs were the only ones up on the circuits. In the first hours, everything went down. We in the amateur radio community were the only means of communication."

Governor and Mayor Confer on 2 Meters

Indeed, the first contact between the Governor of Hawaii and the Mayor of Kauai was via an amateur 2 meter repeater. Landlines and cellular circuits on Kauai were destroyed by the storm, but the KH6JPL repeater, located on Oahu's Waianae Coast, functioned during the entire emergency.

The aftermath of the storm also demonstrated the value of digital communications. Corrigan specifically lauded the local packet cluster: "It showed its full capabilities. We had communications from the very beginning—real time, hard copy. The information was extremely reliable. The operation enhanced our reputation with State and County Officials."

Amateur traffic sent via satellite also moved expeditiously. "UO22 did a great humanitarian service in connection with the hurricane disaster. For the first time, I believe, a PACSAT (packet satellite) was used for health-and-welfare traffic," explained Dave Medley KI6QE, Satgate coordinator. "This has been so smooth and effective that I doubt many users of UO22 have noticed that this is going on. Working in conjunction with an HF BBS network, messages are collected from all over the USA. Some are sent direct to the stricken area via 15 meter packet while others are sent via UO22 to Honolulu, where they are distributed from a central point via ham radio or Navy MARS."

"In the future it is expected that more use will be made of the PACSATS for this kind of traffic, as this demonstration of the capability of UO22 has been

very successful. During the short period that UO22 was down, messages were uploaded to LUSAT, which once more came to the rescue as the good reliable backup that it is."

Inbound Traffic Stresses System

Perhaps the system's success in passing traffic led to its biggest weakness: Many observers noted that health-and-welfare traffic was not always passed expeditiously. Almost immobilized by the storm's wrath, Kauai was not in a position to accept the volume of non-critical, non-vital traffic coming its way. When carrying out the essential functions of daily life became extraordinarily difficult given the lack of electricity, ruined housing, shortage of gasoline, impassable roads, and so forth, well-meant traffic became a burden.

Indeed, several hams noted that the structure that had functioned so well in the early hours of the hurricane's aftermath began to fall apart after the critical phase had ended. As one ham delicately phrased it, the ARRL was "invisible" in supporting everything being done. John Elliott AH6BJ elaborated: "Health-and-welfare traffic is an ARES (Amateur Radio Emergency Services) activity, strictly an ARRL function. The RACES mission is emergency, critical and official traffic. When commercial communications are restored, the RACES mission becomes zilch. Then it reverts to ARES, which is strictly an ARRL function. Unfortunately, there was no ARES structure to interface with the Red Cross."

As a matter of fact, the Red Cross itself came in for a lot of criticism from hams who were involved in Hurricane Iniki and its aftermath. "Our building was hit hard. Eight ground-floor units were wiped out," said Al Shaver AH6KX, describing damage to a condo on Oahu's leeward coast. "We reported our damage to Civil Defense Friday afternoon, just after the 'all-clear' was given. We didn't see anyone from the Red Cross until Tuesday. Then, for three straight days, Red Cross volunteers came by asking us the same questions: What happened? How did you respond? They never offered us any assistance whatsoever."

Hams Fly to Kauai

Several Oahu hams traveled to Kauai on military transports shortly after the storm hit. Many of them reported that

Red Cross officials seemed to have little understanding of the role of communications volunteers and assigned them, instead, to clean-up crews. "I couldn't get leave from my job, but I volunteered to go to Kauai Friday night and stay 'til Sunday evening," mentioned Bill Rhoden AH6IH. "I'm sure some relief workers there would have appreciated going home for the weekend."

"I offered to help expand their packet capabilities or help in any other way with their communications. I was told that if I couldn't stay a week, they didn't want me at all."

Tony Dacres AA8EI, who came to Hawaii via Guam (and Typhoon Omar) to serve as Red Cross Communication Coordinator, presents a different view: "There was no way (on Kauai) to distribute any ingoing traffic. The official Red Cross position was that outgoing traffic was to be encouraged, since that probably eliminated several incoming messages once the off-island family heard from the person on Kauai. In the time I was there, I became aware of a serious problem with hams and the Red Cross with respect to handling health-and-welfare traffic, and a more serious situation locally."

"In my opinion, some education is necessary in both directions—and some cross pollination of message formats—ham, Red Cross and MARS. There was a lot of misunderstanding and hurt feelings. Since I took much of the lightning, I want to try to do something about it before the next disaster. I do hope you all are spared, but since we know something will happen somewhere, it behooves us to act now."

"Lack of standardized message formats made our job much more difficult," mentioned Boykin, referring to his experiences receiving NTS messages passed by Hal Sprague KH6GPI, operator of one of Oahu's most active packet BBSs. "I spent so much time translating these messages into MARS format. I passed 386 messages to Kauai and I had to go into each one and reformat it for the MARS operators. It was really disgusting to have to waste valuable time."

"The big problem is that there was no PIC, person in charge," observed Corrigan, of State RACES.

Coordinated or not, many individuals stepped in and provided necessary and appreciated services. One of the first to reach Kauai was Jerry Wine KH6UH. In addition to providing an ar-



Photo A. Concrete blocks from the seawall were propelled toward the swimming pool at this Oahu QTH.



Photo B. Jerry Wine KH6UH spent several days on Kauai using his radio skills to assist with disaster relief.



Photo C. Nani Rhoden AH6IH found digital communications to be a very reliable way of passing health-and-welfare traffic. (Photo by AH6IH.)

ray of communications services, Wine shot some fascinating video footage of the destruction and subsequent relief efforts. Joe Keola KH6BFZ left the comforts of his Oahu home, untouched by Iniki, and went to Kauai the night of the storm. He set up an emergency HF station and provided some of the island's first communications with the rest of the world.

Chuck Burch AH6IN, Lee Wical KH6BZF, and Bill Rhoden AH6IH on Oahu coordinated many of their HF messages with Keola. "Between Nani AH6II and me, we handled 147 H-&W messages from his station. He is a perfect communicator. If I ever have another emergency situation, I hope he is around to be on the other end of my transceiver." Burch and Wical reported handling similar amounts of traffic as well as numerous phone patches to the U.S. mainland.

Hams Help Each Other

Countless other hams carved low-profile niches in which to be of service. Sunday morning, less than 48 hours after the cataclysmic storm, Philip Naone NH6QO knocked on our door. "I talked with your friend Brian ZL1AIR in New Zealand last night. He had heard about the storm and, of course, was concerned about you.

"I told him I had heard the damage report you gave Friday night on the JPL repeater. I knew you and Al were OK but your building had a lot of damage. Brian wants to talk with you tonight at 0700Z so I brought my tools and a lot of coax with me. Let's get your antenna back up."

On the island of Maui, Ken Arck, Bill Heyde KH6UU, and other members of the Maui Amateur Radio Club used both packet and the statewide RACES repeater system to send over 400 messages from concerned Maui friends and relatives. Arck reports that Maui county officials didn't recognize or appreciate their service. "A lot of us really worked our butts off (that) weekend and nobody seems to care that we did."

Paradoxically, many helped by maintaining radio silence except when actually needed. "I want to thank you guys who just kept quiet," Akagi mentioned at an EARC meeting two weeks after Iniki struck. "You kept the clutter off the air. Everyone appreciates your cooperation."

Clearly, amateur radio operators provided a real service during Hurricane Iniki. Afterwards, their activities provided comfort and solace to the victims and those concerned about the victims. "Just to hear the smiling voices of the loved ones on the mainland when we called them at 2 o'clock in the morning was rewarding enough for Nani and me," expressed Rhoden.

Equally clearly, many steps need to be taken before the next emergency situation. Much of the confusion, inaction and duplication of activity can be prevented or significantly reduced through careful planning. Better understanding of each other's roles, as well as better fulfillment of assigned functions, will reduce bad feelings and—more important—provide better and more timely service. Nonetheless, most agree that Hawaiian hams functioned remarkably well under the circumstances.

"After all, what do you expect?" laughed Elliott, injecting a note of levity into an otherwise serious discussion. "There's a reason they call them disasters!"

Be Prepared!

As every good Scout remembers, be prepared! But what does emergency preparedness mean to the radio amateur? Below are several tips—some of which seem blatantly obvious—to help you be ready when an emergency strikes your community.

Although I considered myself a person very interested in emergency preparedness, I must confess that not until Hurricane Iniki was bearing down on Oahu did I realize how unprepared

I actually was. What I learned during this disaster could help you.

1. **Charge!** When the warning sirens for Hurricane Iniki sounded, I immediately began charging all my NiCds. Fortunately, we didn't lose power for four hours, so I had just enough time to get everything fully charged. But what a silly gamble that was. What if our commercial power had failed sooner?

Don't wait until an emergency is imminent. Keep NiCds, car batteries and other auxiliary power sources ready to be used at all times. And while you're

at it, be sure you know how to switch from commercial power to your emergency sources. Be able to do this quickly and easily, by flashlight and with distractions. Make sure positive and negative connections are clearly marked—a "small" mistake can wipe out your system just when you need it most!

2. **Plan.** Consider the various types of disasters which might hit your locale and develop a personal plan of action. Beyond natural disasters, what else could affect you? Are there chemical factories, dams, or nuclear facilities that might

suffer a calamity? Is there a dormant volcano (there's a big difference between dormancy and extinction!)? What about a hazardous spill from trucks or trains passing through? Know what the correct response is for readying your home for a tornado, a flood, a wildfire, an earthquake, etc. Obviously, some disasters, such as avalanches or hazardous leaks, strike without warning; others, such as hurricanes or volcanic eruptions, usually can be anticipated several hours in advance. Each kind demands its own specific readiness. Should you open

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CIRCLE 300 ON READER SERVICE CARD



Photo D. Lee Wical KH6BZF, operating from his Oahu home, coordinated his communications with Joe Keola KH6BFZ, who hurried to Kauai.



Photo E. Wayne Jones NH6GJ, president of the Emergency Amateur Radio Club, coordinated activities at Oahu's Emergency Operations Center located in the basement of Honolulu's municipal building. (Photo by N6VQE.)

windows slightly or seal everything tightly? Where should you put outdoor furniture and what should you do with pets? How will you obtain water and food if the infrastructure is seriously damaged? Should you evacuate? If so,

where to? Learn the answers to these and similar questions now.

Spend time devising your own emergency response outline. Study the details and then "fully fund" the plan, so to speak. If you should keep a supply

of water on hand, for instance, fill your containers now. Don't waste valuable time looking for flashlights, can openers, battery-operated radios and the like when an alert has been given. Rehearse your emergency response and be ready to roll (no pun) when things start to happen.

In addition to insuring the safety of yourself and your home, prepare your station for use under adverse circumstances. Be able to get on the air quickly after a catastrophe. In addition to power disruptions (which you are now prepared to deal with), antennas often suffer in disasters. Dipoles are not as glamorous as multi-element beams, but they are reliable and easy to construct and to install. Have one ready and know how to set it up, particularly if wind has blown down your usual supports.

3. Network. Get acquainted with your community's emergency resources. Is there an active Civil Defense organization? Are there RACES and ARES groups? What, if any, community involvement will MARS have? Is there an emergency-oriented local radio club? Introduce yourself to these entities and find out how your skills and equipment can enhance their standing plans.

Participate in emergency simulations. Accept a specific operating assignment which you are designated to fulfill in case of a catastrophe. Learn how various groups and individuals work together. Learn who responds before an emergency, who acts while the emergency is at its crisis peak, and who steps in afterwards.

In my own community, there was ill will because some people expected different responses during each of these phases than those the organizations were prepared to make. Do not expect ARES, for example, which is a non-governmental volunteer organiza-

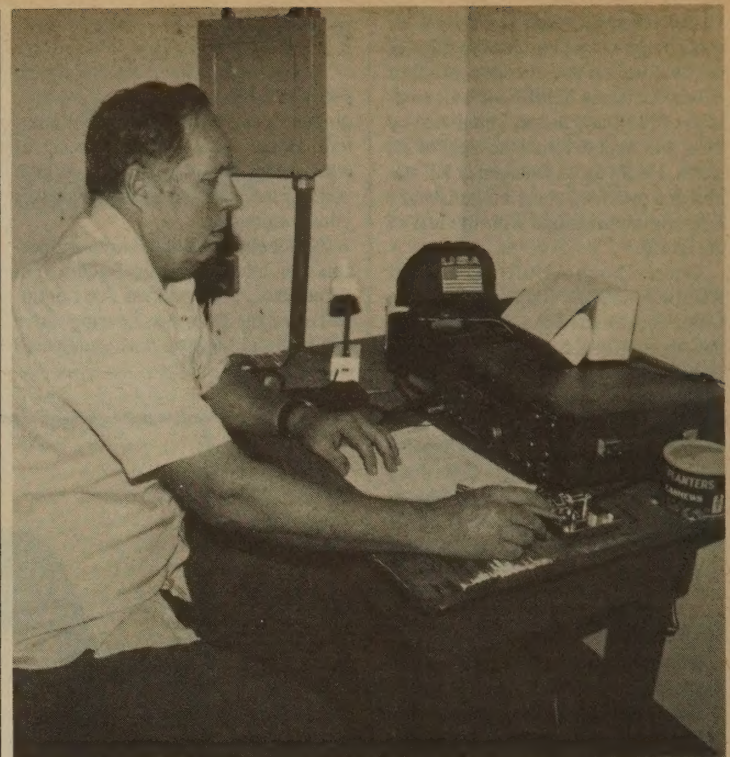


Photo F. Chuck Burch AH6IN copied Kauai traffic and informed concerned loved ones of the conditions on Kauai. (Photo by N6VQE.)

tion, to be actively involved during an emergency. Civil Defense, and RACES, its radio arm, are quasi-governmental groups authorized to act during crises.

4. Respond. After the actual disaster has occurred, respond rather than react. Convey important information to the proper officials. Alert them of casualties or injuries. Tell them the physical condition of your surroundings. Volunteer this information, don't wait to be asked!

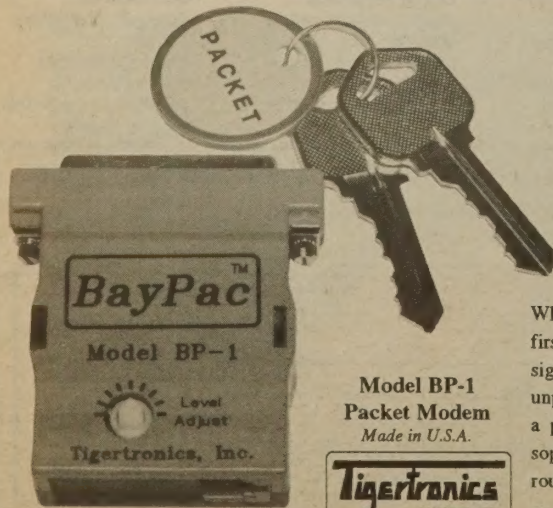
Perhaps this sounds self-evident, but from personal experience I know it is not. Twice my community was severely stricken by hurricanes and twice there was little response for several days because downtown officials were not aware of our plight. Similarly, do what you can to be sure that the information is not only received but also passed on to the proper places. Immediately after the "all-clear" was sounded following Hurricane Iniki, I gave a damage assessment (after being asked for it!!) to someone helping with Civil Defense communications. Although other amateurs later verified that I had made the report, responsible Civil Defense representatives told me they never received any damage reports from my neighborhood.

Don't pester other volunteers but do make sure vital messages are received by persons in a position to act.

5. Stay involved. In the aftermath of any disaster, there are always scores of concerned people to be reassured. Phone patches and health-and-welfare messages are the backbone of amateur radio service following any mishap. Learn the skills to provide these important services. If you do not have the necessary equipment for long-distance communications, no doubt you can relieve someone who does.

The National Traffic System, utilizing digital and satellite communications as well as HF voice and CW, enables hams far from the disaster site to be involved in the follow-up. See if you are in a particularly advantageous position to assist. Be aware, though, that the deluge of inbound health-and-welfare requests may overwhelm local abilities. If the infrastructure is severely damaged, it may not be possible to answer queries rapidly.

No sensible person looks forward to disasters, but realistic people realize that they do occur. Make sure that if you have the misfortune to be involved in some sort of mishap, you can do your utmost to be prepared. **RF**



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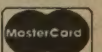
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CIRCLE 269 ON READER SERVICE CARD

Alarm Foil Antennas

Antennas that blend into the woodwork.

by Larry Kahaner WB2NEL

While in my neighbor's house one day explaining how I can phone-patch her brother in Germany, I spied a newly installed alarm system. It was the usual type in which thin foil is taped around the window to form a closed circuit. When the window is broken, the foil circuit opens and the alarm sounds. The foil looked so pleasant and neat on her huge picture window. Since I am always looking for new types of radiators (and what ham isn't?), I wondered about alarm foil. Indoor antennas are not new to me. I had some indoor dipoles in my old apartment but they always looked so ugly and had to be removed when guests came. Perhaps foil was the cosmetic answer.

Window foil is available at Radio Shack and most hardware stores. I obtained a roll from the man who installed my neighbor's alarm. A 200-foot roll cost me about three dollars. The tape I bought has a paper backing which is peeled away,

exposing a sticky foil. I made several tests and found that the tape could be applied to a painted wall and later removed without leaving a mess. I advise against placing it on wallpaper.

My house has a crown molding on the top perimeter of the room and I applied the tape in dipole fashion, starting from the center. At the feedpoint I folded the tape on itself for about one inch. The tape exhibits great strength resisting pulling apart, but will tear easily if twisted. Fold the tape at right angles to prevent the coax weight from tearing it. If you make a mistake or tear the tape, another piece overlapped will make a tight contact despite the adhesive. Check with an ohmmeter if you feel insecure. I thought of different methods of feeding and decided that the simplest was also the best. I used alligator clips from my coax. This would allow me to remove the coax without taking down the antenna.

Coax climbing a white wall leaves much to be desired.

With everything in place, I loaded up the rig. My matchbox was waiting in the wings. My transceiver loaded up easily, with an SWR of 1.7 to 1. [Ed. Note: As with any indoor antenna, it's a good idea to use minimum output power to minimize radiation hazards in your ham shack.] Since my calculations were for the center of 20 meters, I peeled and cut a little off each end until it was perfectly matched for the center of the phone portion. I tuned and heard a very strong CQ from the Midwest. I answered pessimistically and he responded with a 57 report. Other reports from that area were also encouraging.

I added some tape to the ends and pruned it for the low end of the CW segment. That afternoon I worked two G's, one I and one DK. All were better than 459 reports. It is not necessary to add and subtract tape for

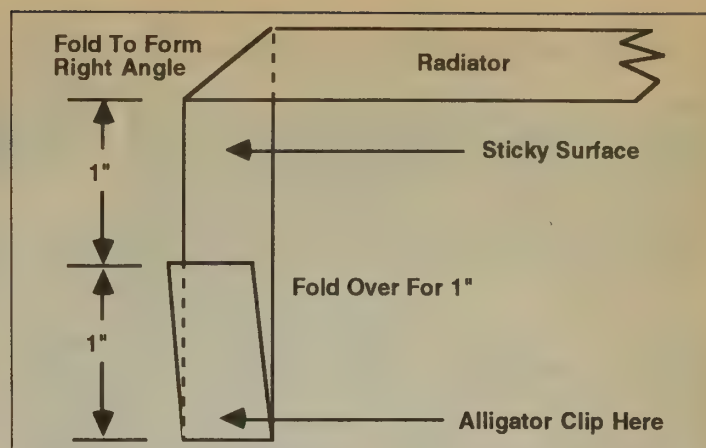


Figure 1. The coax clips onto the feedpoint connection of the alarm foil antenna. Reinforce the connection point as shown.

each segment of the band. It is as broadband as any other dipole but I felt that any extra push was helpful.

The configurations of foil antennas are limitless. If your apartment is the right size you might try putting a reflector or director on an opposing wall in another room. With a matching network you should be able to work the low bands with a shortened antenna. It would also make a great "longwire" for the SWL who is apartment bound. Even though the adage "the higher the better" still applies, if you live on the 29th floor of a 30-story apartment house, the working difference between crown molding and baseboard mounting

will be minimal. And, it will be better hidden on the baseboard. Window foil is especially good for sealing RF leaks in a home-brew chassis. And I have found that a folded dipole of foil hidden on the back of a dresser makes a fantastic antenna for commercial FM reception.

Dipoles can never compete with four-element quads up 75 feet, and indoor dipoles even less. But for the ham living in the canyons of the big city an indoor foil antenna can be the answer to never getting on at all. **RF**

Reprinted from the February 1976 issue of 73 Amateur Radio.

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CIRCLE 105 ON READER SERVICE CARD

A Portable 40 Meter Helical Dipole

by Fred Peerenboom KE8TQ

"I don't care what kind of wires you string up, as long as no permanent towers are built. And don't interfere with my television or satellite dish," my landlord said when I asked him if I could construct some antennas around the duplex we share.

I took care of 10 through 20 meters with a partially concealed mast behind the garage, topped with a five-band (no radials) vertical. But, how about 40 meters? A lot of my friends hang out there during the day on some informal nets. A full-size 40 meter dipole needs over 66 feet of horizontal space. That's 66 feet of clear space I don't have on this city lot. The verticals on the market that cover 40 meters and don't require radials will poke a hole in your wallet and end your spouse's patience with your spending habits.

In the past I have tried a lot of other restricted space antennas, but most of them failed to perform adequately. Some failed because of incorrect information, but the main reason hinged on all the aluminum siding on the duplex. After giving it much thought, I finally decided to construct a helical dipole. Short (only 1/10-wavelength long), light, and quite portable, as well as relatively inexpensive, it embodied the features I was looking for.

Construction

The heart of the antenna is a pair of low cost metal Slinky® toys available from most toy stores. The coil, when stretched out to 15 feet, just happens to be electrically equivalent to a half-wave 40 meter dipole. Take two of them, stretch each one out about 7-1/2 feet, feed them in the center with 50-ohm coaxial cable and, "Voilà!" you have a half-wave helical dipole for 40 meters.

Supporting the coils without putting up permanent masts was equally simple. Common PVC pipe turned out to be just the ticket. It's lightweight, easy to work with, and readily available in hardware and do-it-yourself stores. There is an added bonus to using PVC: The fittings available for the pipe make assembly and disassembly of the antenna quick and easy.

The PVC pipe comes in 10-foot sections so you will need a hacksaw or other fine-toothed saw to cut it. I also find it a good idea to use a medium file or piece of sandpaper to deburr the pipe after cutting it to make assembly easier. The only other necessary tools can be found around the house or garage. You can glue a few of the sections together (see Figure 1 for details), so get a good-grade cleaner and glue at the store when you get the PVC pipe.

Start by cutting two 8-foot-long pieces of pipe for the horizontal supports. De-burr the ends and glue a 90-degree elbow to the outer end of each section. The elbows will be

where the vertical support masts, also constructed of PVC pipe, will connect. Make sure you do not have any burrs on the two 8-foot sections; the coils must slide freely on them without catching, since this is how you tune the antenna.

The center connector is made from a "Tee" fitting. On my antenna I cut a 7-inch piece of scrap PVC pipe and glued it into the lower fitting of the Tee. I then strapped my 1:1 balun to it with plastic wire ties. The balun makes a convenient way to anchor the popular toy's coils at the center, and it keeps the TVI down to a minimum.

Slip a coil over each side of the horizontal supports and push the inner ends of the pipes into the center connector, but don't glue them. This will be the disassembly point when you take the antenna down! Now strap your balun to the center connector and, using two 1/4" electrician's split bolts, connect the inner ends of the coils to the balun's antenna connecting points. You will need the split bolts as you cannot solder to the coils. The split bolts have proven to be trouble-free connections in my system. Tie lengths of light nylon cord to the outer ends of

the coils. These will be your "tuning devices" when the antenna is up in the air, so make sure they are long enough to be reached from the ground. Now, push an upright leg into each of the 90-degree elbows at the outer ends of the cross pieces, but don't glue them! If you are not using a balun, just anchor the two coils about three inches apart in the center of the horizontal assembly with a couple of 1/4" bolts through the support pipes that have been joined with a standard coupling.

You can make the upright masts any length that is appropriate for

your location. Here at my QTH I have a second-story deck that is 10 feet above ground, so I made my two support legs 15 feet long. The antenna height of about 25 feet gives me the fairly high angle of radiation which I need for the short-to-medium-range coverage that I desire. Your best bet is to tailor the antenna height to your needs. The higher you put your antenna, the lower your skip angle will be, and the longer your transmitting range. The important thing to remember is: If it works, use it. Just try to keep the antenna as far away from any large

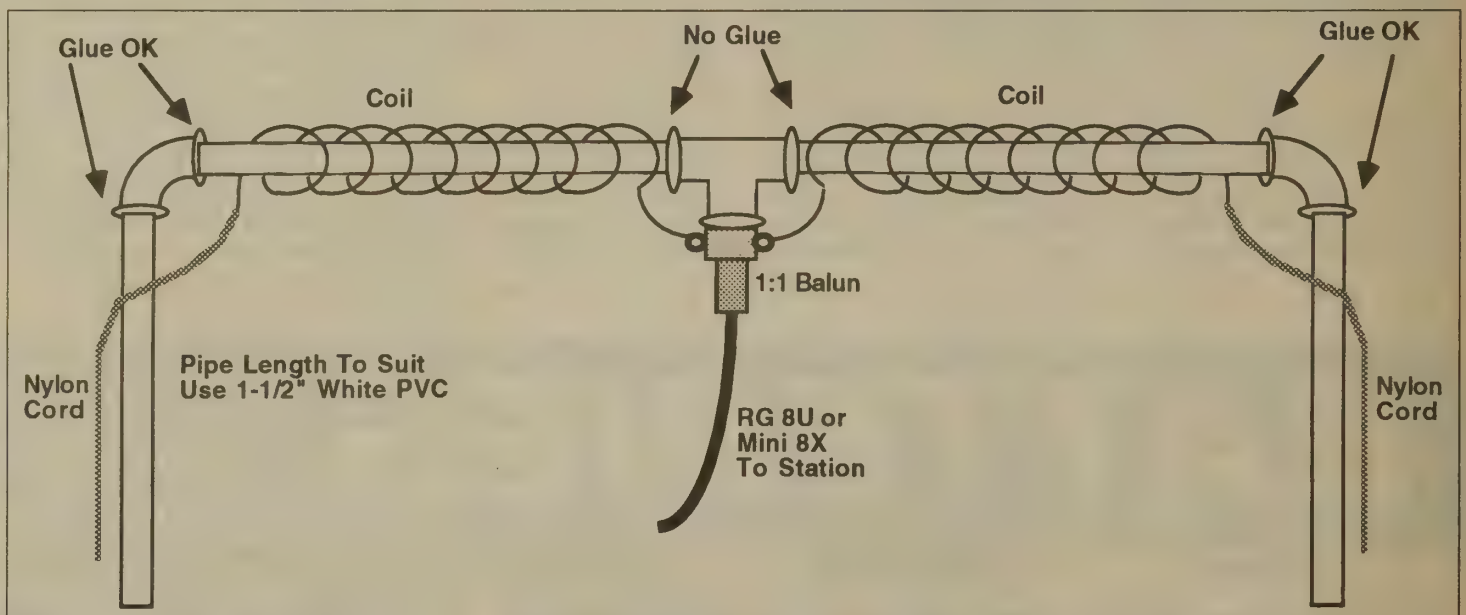


Figure 1. Complete 40 meter helical dipole.

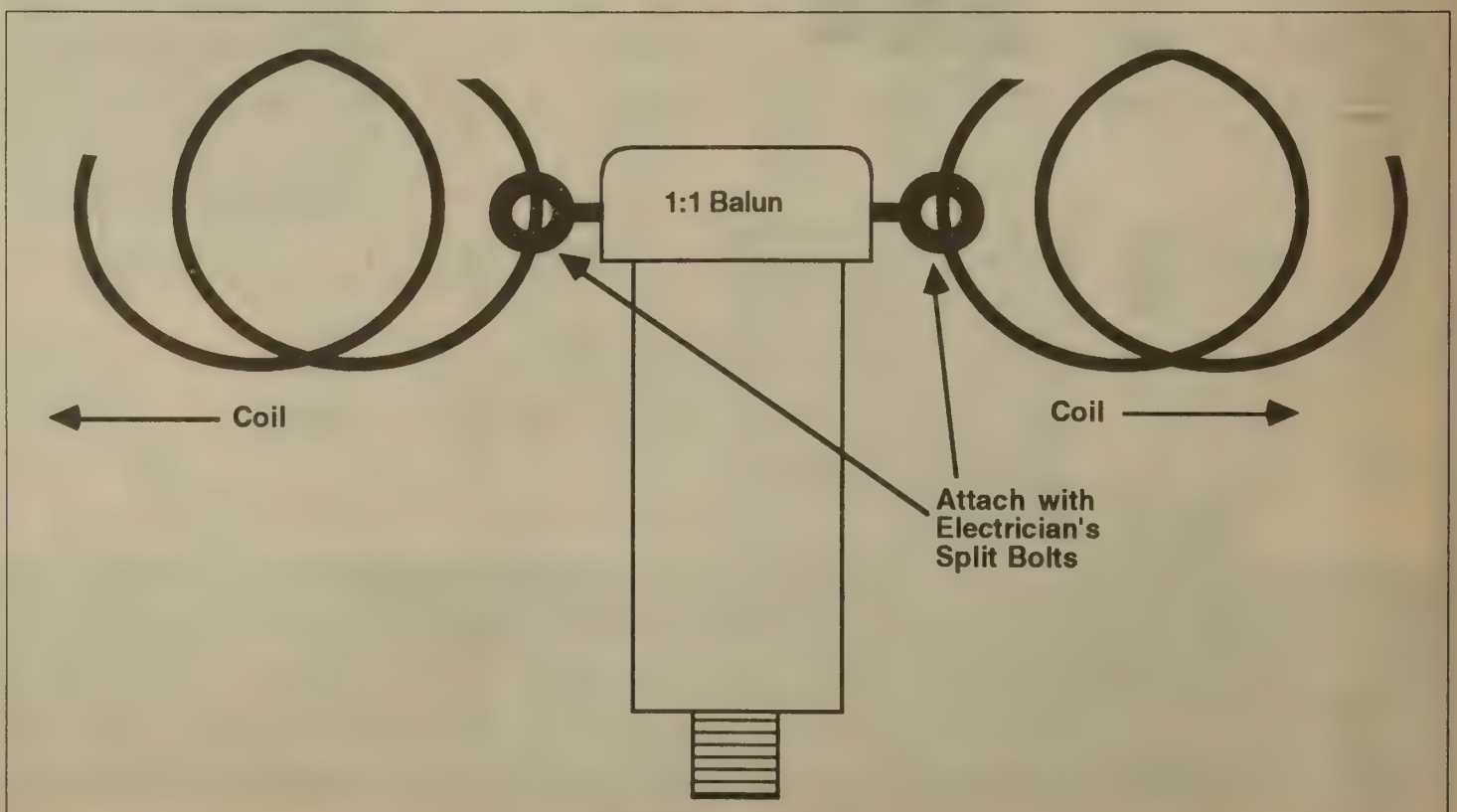


Figure 2. Balun details.

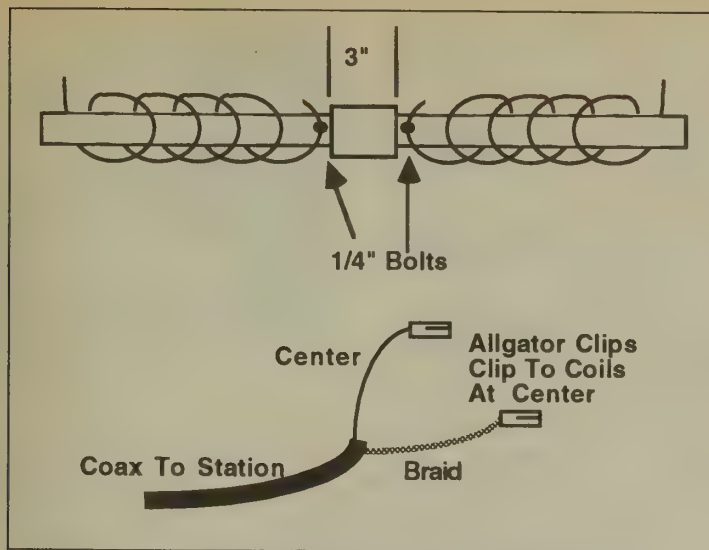


Figure 3. Central section of the non-balun version.

mass of metal, such as aluminum siding, as you can.

Raising the Antenna

Before you raise the assembly you will want to drill a 1/4" hole through each vertical support leg near the top for the nylon tuning cords to pass through.

If you have one, you can set the approximate length of the coils with a noise bridge. Connect the noise bridge directly to the input of the balun with a double male adapter. If you are not using a balun, make up a 6"-long jumper out of RG-58/U cable, with alligator clips on one end and a PL-259 connector on the other, to connect to the coils. Next, attach the noise bridge receiver port to your receiver with a length of coax and set the bridge controls to 50 ohms resistive and 0 ohms reactive. Tune

your receiver to your working frequency and adjust the length of both coils equally to get a deep null in the noise on the receiver. When you find that point, mark the horizontal support with electrical tape for future reference.

If you do not have a noise bridge, stretch each coil out 7-1/2 feet and mark those spots for your starting points.

Now, connect the feedline from your rig and you are ready to raise the assembly up in the air. If you are not using a balun at the antenna feedpoint, the best way to connect the feedline will be with alligator clips soldered to the center conductor and outer shield of your coaxial cable. Then just clip the center conductor to one coil and the shield to the other.

I usually get help to steady the assembly while I strap the support legs

to the deck rail with strong cords. I haven't had the antenna blow over yet, but if you live in a windy area, you may want to add a few guys of nylon line to steady the unit.

It's now time for the smoke test. Apply just enough RF power from your rig to the antenna to get a reading on your SWR meter. Use the nylon cords that you tied to the coils and ran through the holes in the vertical legs to shorten or lengthen the coils to fine tune the antenna, being certain that you keep both coils the same length.

Because of the short physical length of this antenna, you will find the bandwidth to be quite narrow; also, the location of your antenna and the height above the ground have a major effect on its tuning. Because of this I tuned the antenna across a series of frequencies 50 kHz apart and marked each point with colored electrical tape on the bottom of the horizontal support pipes where I can see it when the antenna is up in the air. Now when I make any major change in frequency, I can quickly adjust the coils to the proper mark for tuning.

Although I don't have a full-size 40 meter dipole to compare my helical version to, its performance speaks for itself. It does the job I want with only 100 watts output from my transmitter, the balun at the feedpoint keeps the TVI down, and the landlord is happy because it isn't permanent. What more could a ham ask for except, possibly, a new "Super Bells And Whistles 9000" rig to go with it?

Since I've constructed the 40 meter antenna, my thoughts have strayed to making an 80 meter version. All I'd need are a few more of the kid's toys and some more PVC pipe. The possibilities are endless. **RF**

The Theodore Roosevelt Amateur Radio Club



Photo A. The Hope Christian Academy amateur radio class.

We need to get more kids involved with amateur radio. With that inspiration, Steve Allar NØELA of Beulah, North Dakota, sent us photos and a description of what they are doing in that part of North Dakota.

Their club is called the Theodore Roosevelt Amateur Radio Club, based in Dickinson, North Dakota. At one club meeting, the Kenwood Kids Program was brought up. They all thought this was a very good idea so one member, Doug Roise AAØCV, approached the Hope Christian Academy in Dickinson about starting a class. The school was receptive, and a class was formed. The class consists of grades 4 through 6. The kids' are from 10 to 12 years old. Their teacher is Karen Landblom. There are 12 students.

Doug AAØCV teaches the kids about amateur radio with the *Now You're Talking* books. He is assisted by his sons, Peter NØLZO and Andrew NØLZN. He comes to the classroom for 45 minutes each day,



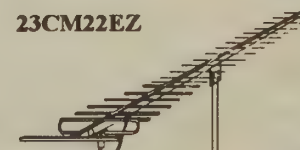
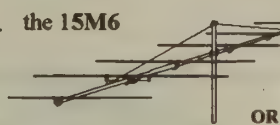
Photo B. Doug Roise AAØCV teaching his class.

Monday through Friday. At the session shown in the photos, Doug was teaching the students "Rules and Regulations," and also conducting some CW practice.

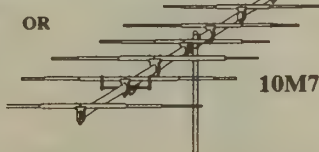
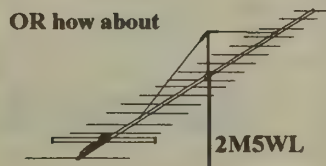
The kids seem to be enjoying themselves and learning, too. The club hopes to turn out a dozen new hams at the conclusion of the class (they have a tentative testing date of March 21). The club wishes them all success, and would like to thank the Kenwood Corporation for their **RF**

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CIRCLE 274 ON READER SERVICE CARD



radio magic

by Michael Bryce WB8VGE

Since there are only so many ways to produce an RF signal, many companies started to add increasingly more operating features to their equipment. The so-called "radio of the month" is nothing more than a manufacturer's basic rig—but with a new knob controlling a new feature.

However, in the past year or so, there seems to be a new buzzword flying about. It's called Digital Signal Processing, or DSP. One could very easily fill an entire issue of *Radio Fun* describing Digital Signal Processing. Let me try to reduce the overhead to some very simple terms.

Digital Signal Processing

Digital Signal Processing is a very new kid on the block. A special function microprocessor is the brain behind Digital Signal Pro-

cessing. A common Digital Signal Processor or CPU is the TMS320C10. The TMS320C10 operates at 20 MHz and is capable of processing of five million instructions per second (MIPS). The TMS320C10 has two separate memories: one for the program and the other for signal data. The programs (usually two or three) are held in an external PROM or Programmable Read-Only Memory. Someone writes the proper code (it's called software and when the software is burned into a PROM it is now known as firmware) and then burns a PROM with a computer with the proper interface. By changing the firmware by way of the PROM you can change the function of the DSP processor.

Most of the DSP circuits today deal with audio filters. In particular, the application of DSP works best on multiple automatic notch

filters and nonlinear CW filters. Automatic SSB fine-tuning as well as audio processing for RTTY/AMTOR and HF packet is also within DSP programming.

In the past, if you wanted to eliminate a tuner-upper or other CW QRM, you did so with an analog circuit. You could use op amps, LC networks, RC networks and other audio cut-off circuits. With DSP, the use of a microprocessor gives an almost perfect bandpass filter frequency response. That's something really hard to do using even the best op amps and high quality components with an analog circuit. But the real beauty of DSP is the ability to change the frequency cut-off or bandpass frequency response by simply changing the firmware. To change the cut-off frequency of an analog audio filter requires changing out individual components.

Here's an example to show how DSP and an analog circuit compare. Let's say we're on 40 meter SSB. It's getting late and the broadcast stations are coming on. If you're in a QSO with someone and HCJB comes online, the heterodyne from the two signals will make for difficult copy. Most of the rigs produced today have an audio notch filter built in. Some of these filters have very steep skirts and have a notch depth of between 40 and 60 dB down. Careful tuning of the notch control will eliminate (or greatly reduce) the interference, allowing you to continue with the QSO. Now, provided neither one of you moves, HCJB will stay in the notch filter and all will be right with the world. But, what happens if you change frequency—even just a few cycles? Well, the notch control will have to be re-adjusted to reject the heterodyne again. What happens if a second (or third) broadcast station comes up? Our notch control can only do one signal at a time! So more than likely it's QRT for the evening without a DSP audio processor inside your rig.

But what makes me madder than Jim Bowie with a dull knife is the "shoosher." A shoosher is someone sweeping a transmitted carrier band back and forth across the passband of your receiver. They are almost impossible for an analog notch filter to eliminate. It's impossible to manually track such

a carrier with a hand-tuned audio or IF notch filter. They're too fast to catch and keep tuned. A DSP automatic notch filter can easily handle the shoosher and make life easier on 40 meters. Depending on the firmware and the DSP unit, some are able to handle several shoosher and carriers at the same time.

So, if all of this DSP stuff is so great, why have we seen so little of it? Well, price is one reason; another is that it's new. New things scare people. High-speed CPU chips are being made cheaper all the time. The cost of digital signal processing has dropped to the point where it is competitive with analog techniques.

There are some drawbacks to DSP, too. For one thing, a CPU running at 20 MHz generates all kinds of EMI (Electrical Magnetic Interference). Keeping EMI out of a very sensitive front end of a radio is quite an engineering task. It's bad enough to have phase noise on top of a signal you're trying to copy, let alone adding extra signals from the circuit trying to pull the station out!

Should your new radio have DSP? Yes! The future is here. Like the built-in antenna tuners, built-in DSP will give you a lot of performance for the money. It's also cheaper to buy a rig with DSP already inside than to add it later.

Continued on page 27

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the tech side

by Michael Jay Geier KB1UM

The End of Amps

Let's finish up our discussion of amplifiers. Last time, I mentioned that an amplifier's current could be pulled through a transformer instead of a resistor. Why do that?

Waste Not, Want Not

We saw that it is necessary to have a ratio of resistances to accomplish voltage amplification; that's how we convert current changes into voltage changes. Once our signal has enough voltage, though, we need to current-amplify it if we want to drive much of a load with it. Certainly, it is possible to use a resistor for that, too, but it sure is wasteful. Much of the amplifier's power winds up getting converted to heat in the resistor instead of being delivered to the speaker, antenna or whatever. Is there any way to increase the efficiency of the circuit?

There sure is! What if we pull the amplifier's current *directly* through the load? Let's try it. Let's put a speaker in place of the resistor feeding the gain element. What happens? Hey, it works . . . sort of. You can hear something coming from the speaker, but it ain't very loud. And the speaker cone is pushed way out. And wait a minute, the transistor pulling the current through it is getting awfully hot. Isn't there supposed to be *less* heat this way?

Matchmaker, Matchmaker

Let's take a look at why this doesn't work too well. Yes, we are pulling all the current through the speaker. However, that speaker has only eight ohms of resistance! That means that the transistor doing the pulling has to pull very hard. In other words, the speaker isn't limiting the current flow very much, so the transistor gets mighty hot because too much current is flowing. Also, with such low resistance, the ratio of the two resistances (the speaker's and the transistor's) is reversed from the optimum; the transistor's should be able to go both lower and higher, in order to pull the current through the speaker both high and low, moving the cone a significant amount. Here, the transistor's resistance is mostly above that of the speaker, so not much moves. It's almost as if the speaker were a dead short compared to the hundreds of ohms present in the transistor. Essentially, the low-impedance speaker is a *poor match* to the transistor. By the way, the rea-

son the cone is distended is because DC power is flowing through the speaker's coil, causing it to keep the cone pushed out. (Remember, a speaker is just an electromagnet wrapped around a permanent magnet.) If you reverse the speaker leads, the speaker will stay pulled in. What we really want to send to the speaker is a changing current representing an amplified version of the input signal, right? Well, there's an easy way to do that which also cures the mismatch problem. Let's use a transformer.

Iron It Out

A transformer is nothing more than two coils of wire wrapped around an iron core. Its name is particularly apt because it really does transform, or change, the ratio of current to voltage from its input to its output. How? Current flowing through the first coil creates a magnetic field around the iron core, just as would any electromagnet. As that field cuts through the windings of the second coil, it generates a current in that coil. So where's the magic?

The trick is that the two coils don't have to be the same length! When the power is in the form of magnetism, it is "classless." That is, it consists of a single quantity: magnetism of a certain strength. It has no specific voltage or current equivalent; only the total power (current times voltage) is important. If we wind lots of wire on the first coil, it will have enough resistance to match the amplifier's transistor. If we then wind fewer turns of wire on the second coil, its resistance will be optimum for the speaker. So, the higher-voltage, lower-current power applied to the first coil will be transformed into a lower-voltage, higher-current power source in the second coil, which is just what we need to drive an 8-ohm speaker. Of course, the total *power* will not be increased, just the form in which it is delivered. In other words, if we double the current, we halve the voltage; the number of watts stays the same. If that weren't true, we could use transformers as amplifiers themselves! Oh, well, there ain't no free lunch.

Humanity's Salvation?

Hey, if we can generate power with a magnetic field, why not just take a bunch of permanent magnets and wrap coils around them, thus ending humanity's energy crisis once

and for all? Unfortunately, it is only the *changes* in the field which make power in the coil. In effect, the magnetism is a kind of catalyst. If you *move* the magnet, the changing field will create power, and that's exactly what electric generators do when they spin the coil in a magnetic field. But it takes more power to turn the generator than you get out of it (because no process is perfectly efficient; there are always losses), so there goes perpetual motion. In fact, the lower the resistance of the load you connect to the coil, and thus the more current you are drawing, the harder it becomes to turn the generator! Too bad, but we didn't get to write the laws of physics.

The Last Trick

Oops, I promised that the transformer also would cure the problem of the speaker cone's being pushed out or pulled in all the time. Well, just as in the generator example, the constant DC power being pulled through the first coil does not get transferred to the second coil. Only the changes in it, which correspond to our signal, make power in the second coil. Obviously, the bigger those changes, the more power gets to the speaker. And, with the DC blocked, the cone moves back and forth, just as it should. By the way, the first coil is called the *primary* and the second coil is called the *secondary*. Those terms are relative, though; whichever coil you connect to the power source is the primary and the one connected to the load is the secondary.

OTL

It is possible to match an 8-ohm speaker directly to an amplifier without using a transformer. It requires a particular type of design, though, in order to make the amplifier's resistance low enough. In this case, the DC power is not pulled directly through the speaker. Instead, the speaker is connected across (in parallel with) the amplifier at its output point. Such a design is called OTL, or Output TransformerLess. Most of today's stereo amplifiers work that way, because transformers have certain characteristics which interfere with pure sound reproduction. Also, the transformers are heavy and expensive.

RF

Getting power to an antenna is

much the same. Obviously, you can't pull power through an antenna because there is no DC path. But, you can apply it either through a transformer or directly from an amplifier which is designed to match it. Most commercial HF rigs take the transformer approach. Luckily, transformers designed for such high frequencies can be much smaller and lighter than those used for audio. Most VHF radios, however, do not use transformers because it is tricky to design a transformer with low losses at those frequencies. They use an OTL approach similar to the one used for stereo amps.

Try It

The specifics of designing various kinds of amplifiers are beyond what we can cover here. If you want to learn more, though, get some parts and try making some small audio amps. The best place to start is with an LM-386 chip. This 8-pin IC can be had for next to nothing at Radio Shack. It is an OTL design which couples the speaker with a capacitor to block the DC. Get one and fool with it; you'll have lots of fun. And, when you're done, you will have a nice little amp you can use in all kinds of receiver projects. Also, if you get some project magazines or booklets, you will probably find the diagrams for some simple non-IC amplifiers. Those will give you a better insight into the workings of real, practical amplifier circuits.

Now, let's look at a letter:

Dear Tech Side,

I have two batteries for my 2 meter HT. One is for 3 watts and the other is for 5 watts and is much bigger. But they last about the same time before needing to be recharged. couldn't the bigger one last longer?

Signed,
Bigger is Better?

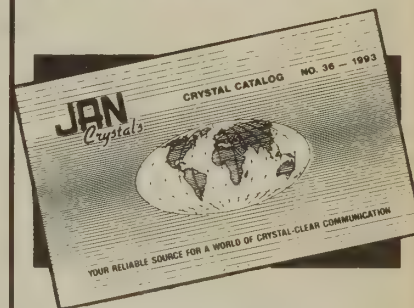
Dear Bigger,

The wattage ratings you are describing refer to how much power the battery will make the radio put out when you are transmitting. The 5-watt battery has a higher voltage than the 3-watt one, and that makes the transmitter work harder and put out more power. But, it's the amount of current, not voltage, stored in each battery that determines how long it will last. If your radio draws, say, 500 milliamps, a 500-milliamp-hour battery will last one

hour, and a 1,000-milliamp-hour battery will last two hours, regardless of its voltage, and regardless of how much power your transmitter is producing. In fact, most radios draw more current when putting out higher power, so they consume the higher-voltage batteries even faster.

Well, folks, that about does it for this month and our discussion of amplifiers. Next month, something new! 73 until then from KB1UM. **RF**

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Joe Carr
K4IPV

antennas, etc.

by Joseph J. Carr K4IPV

Antenna Patterns and Reciprocity

Standard wisdom tells us that the dipole antenna has a "figure-eight" radiation pattern. Right? Yes, but it's also wrong. We tend to see antenna patterns from one viewpoint only, and that is usually from the plain-view perspective. That is, the antenna pattern considered is the *azimuthal* pattern. On the dipole, the figure-eight pattern is the azimuthal pattern. But the azimuthal pattern is not the full extent of it, for antenna patterns are three-dimensional.

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Figure 1 shows the pattern for a vertical radiator in free space. This figure is adopted from a U.S. Army Korean War vintage radio training manual, which seems to do a better job of describing the situation than many modern ham publications. In the lower left is the three-dimensional pattern, which resembles a "doughnut" or "torus" shape. It has a depression in the center above the radiator, which represents the null region in the vertical direction. This figure shows two sectioned views: one taken horizontally through the torus; the other taken vertically.

Antenna patterns for each section are also graphed. The horizontal or azimuthal pattern is the omnidirectional pattern normally considered for vertical radiators. The vertical pattern, or elevation extent, shows a variation in the pattern, with a lobe

in each direction and a null straight up.

Real antennas will vary somewhat from the patterns shown here for a variety of reasons. When a vertical is placed near the ground, only the top half of the vertical extent pattern is available. Also, when the antenna is other than $\lambda/4$, the maxima on the vertical pattern will be different than for the $\lambda/4$ case. The angle of radiation, which is the angle that the maxima makes with the earth's surface, or at least a line tangent to the earth's surface, seriously affects where in the universe the signal goes.

We can get a partial, but reasonably complete, view of the antenna pattern by considering the azimuthal pattern and at least one elevation cut. It is not generally necessary in amateur radio circles to graph the entire pattern. However, in professional engineering circles it is usually necessary to take a look at a number of different cuts.

Antenna Reciprocity

The Law of Reciprocity (apart from its New Age connotations) concerning antennas is real simple: Antennas operate the same in both receive and transmit modes. In other words, the pattern for the antenna in receive is identical to the pattern on transmit. This law is one of the Articles of Religion amongst antenna gurus. Every time someone claims to have invented a nonreciprocal antenna a flaw is found in either their measurements or logic. Reciprocity still reigns.

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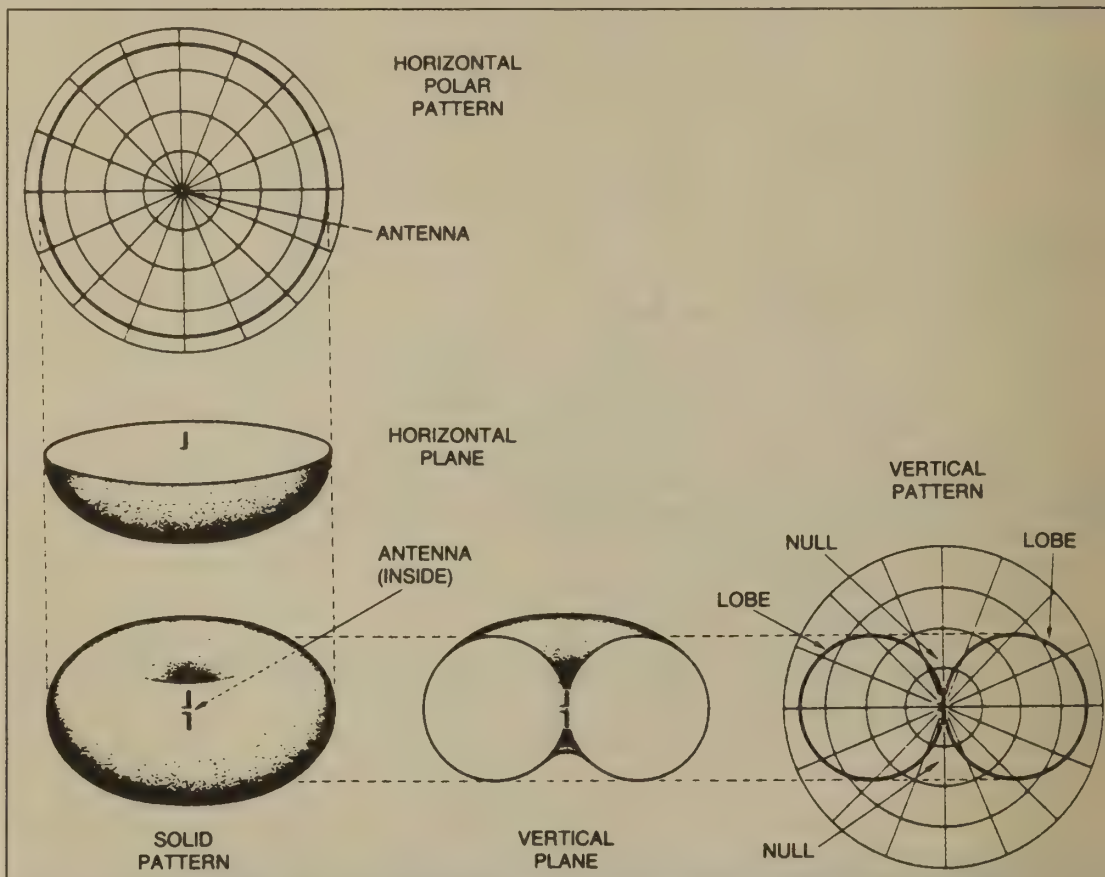


Figure 1. All-dimensional radiation pattern for a typical $\lambda/2$ vertical radiator in free space.

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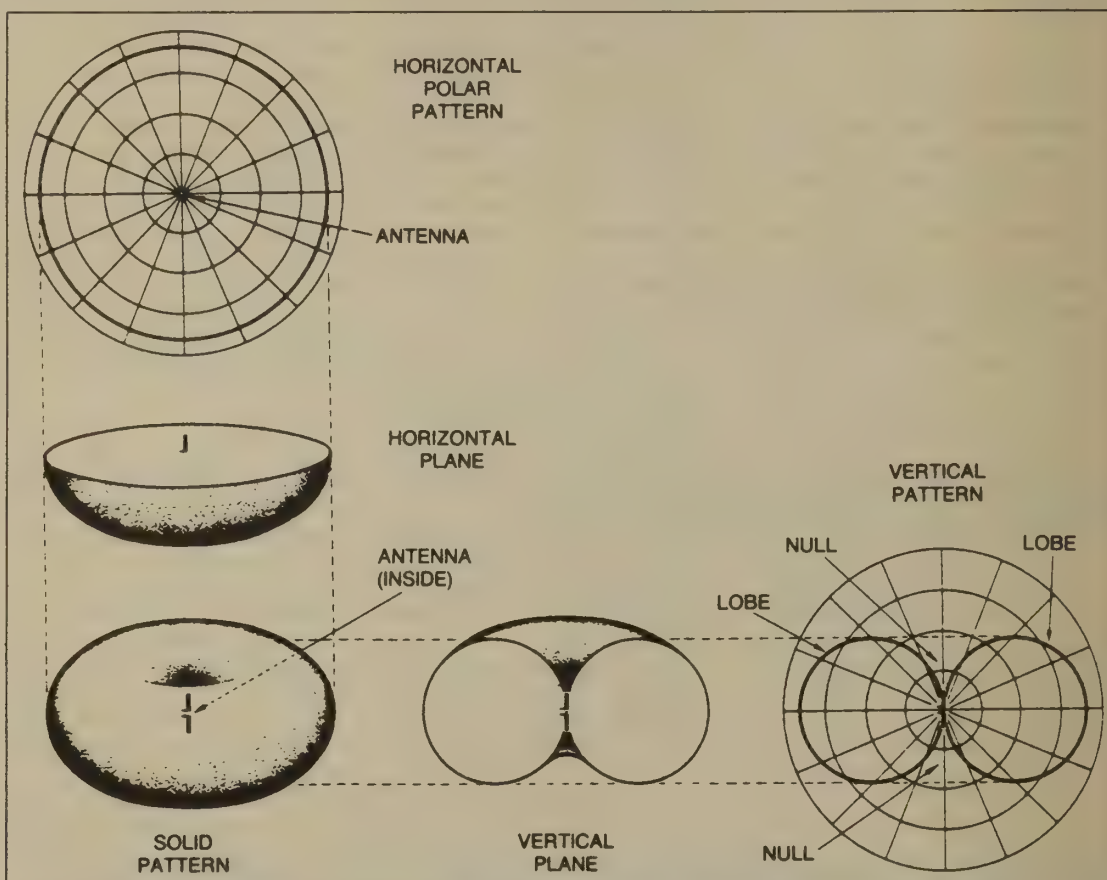


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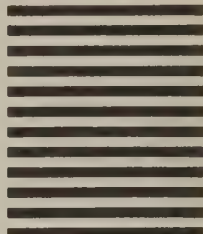
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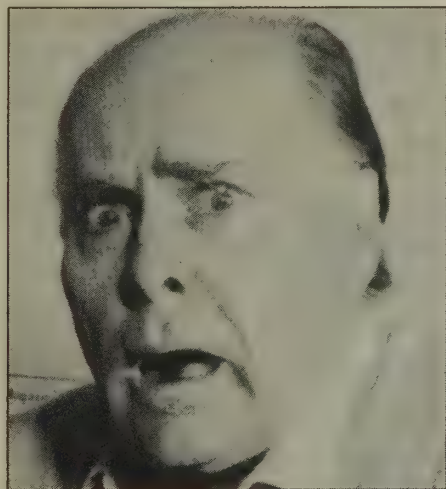
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What are you . . . nuts?



Our founder, Wayne Green W2NSD, upon hearing that you were not yet subscribing to *Radio Fun*.

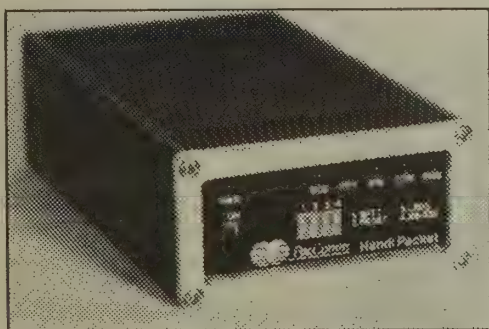
I'm shocked! I'm outraged! I'm beside myself and I'm flabbergasted!

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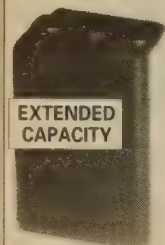
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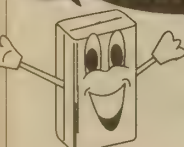
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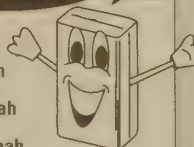
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what's next?

by Carole Perry WB2MGP

Fun With Magnetism

If you're a teacher or volunteer instructor of ham radio you already know the value of providing lots of hands-on excitement for your students so that their learning experiences can be optimized. If you are a student in a formal school setting or an attendee in an evening license class, you might enjoy bringing in some fun ideas to share with your class. We all learn better when we're involved, active participants in our own learning process. When I introduce any new unit to my 6th, 7th, and 8th grade ham radio classes, I do my homework first.

At the beginning of each term we learn about magnetism and electricity. The materials and experiments that I'll share with you can be adapted to any age group. Since the backgrounds and abilities of every class are different, it is the teacher's responsibility to make sure that the lesson will be relevant and comprehensible to the particular group he or she is working with.

Historically, our knowledge of magnetism and our knowledge of electricity are two separate streams, originating in antiquity and merging near the beginning of the last century. In nature, however, magnetism and electricity are intimately related forms of energy, each one capable of producing the other.

The phenomenon of magnetism has been known for centuries. The fact that certain kinds of iron or iron ore had the power to attract other bits of material containing iron must have been known in ancient Greece. The name "magnet" probably comes from Magnesia, a province in northern Greece where large deposits of magnetic ore were found. Magnets became an important instrument in navigation when it was discovered that if one was suspended so that it could turn freely it would swing into a north-south position; thus, the magnet becomes a compass. Some legends ascribe this knowledge to the ancient Chinese. Over one thousand years ago they presumably were using magnets as compasses. In the writings of Hebrews, Greeks and Romans, the magnet is often referred to as a "lodestone," meaning "leading-stone" or "directing-stone."

The classroom teacher can have some of the youngsters research the significance of this discovery from a historical perspective, while another group presents its findings from a scientific viewpoint. When the 6th graders at my school study about Columbus and the discovery of the New World, they are able to add enrichment activities and interesting follow-up projects to their social studies classes by pointing

out how the invention of the compass made it possible for men to venture out into the great unknown—the oceans of the world. I always try to coordinate my lessons with the social studies and science teachers. Ham-radio-related curriculum can provide highly motivational material for other subject areas.

The "Anti-Gravity Machine"

One of the experiments the kids have a lot of fun with is constructing an "Anti-Gravity Machine." The materials you'll need are a drinking glass, a magnet, some tape, a paper clip, and about a foot of thread. Set the magnet across the top of the glass so that one end extends over the rim. Tie the thread to the clip and stick it to the magnet. Tape the thread to the table and begin pulling the thread gradually through the tape until you've pulled the clip off the magnet. Keep pulling until the clip is an inch or so from the magnet. Stick the tape down extra hard to keep the thread from pulling through any more.

Leave the clip there, suspended in mid-air, straining on its leash, caught in a real-live "tractor beam." This always amazes the kids. As the class watches the clip pulling on the thread, they should focus on the empty space between the clip and the magnet. It's a great classroom demonstration on showing that there is a force at work. The children, or whoever is observing this, will probably wonder if the force can be blocked.

Have some inexpensive materials ready to do some follow-up experiments at this time. Put a piece of fabric in the space; don't touch either the magnet or the clip. Does anything happen? How about a piece of plastic? What happens with aluminum, glass, a penny, or a piece of paper? Have a student stick his whole finger in there and see what happens. Next, try another paper clip, or a fork. Have a group of students record all the observations. This leads you to the next question: "Why do some things cause the clip to drop, and others don't?"



Photo A. Eighth graders having fun doing experiments with a magnet and a glass.

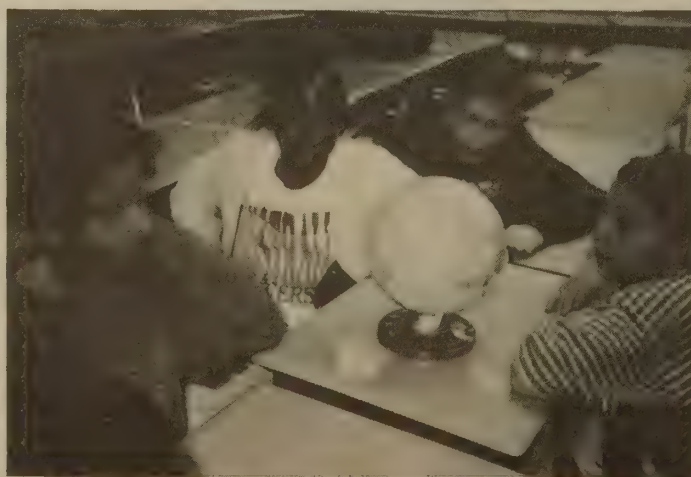


Photo B. The unit on magnets leads to a discussion about the earth's magnetic poles.

"Dinnertime Magic"

John Cassidy's *Explorabook* has a great "Dinnertime Magic" trick that all the children love to perform at home. Always remember that "fun" is the name of the game. Tell the kids to take a magnet and strap it with a belt or shoelace to the top of their thigh underneath their pants or skirt. They'll also need a fork and a paper clip. Here's how the "magic" goes:

Wait 'til everyone is seated around the dinner table (wooden, not metal). The student then crosses his legs so that the magnet is pressed tight against the underside of the table. The paper clip should be in a shirt pocket. The child then tells his unsuspecting family that he has discovered that he possesses strange "new powers." He has "discovered" that he's been able to bond certain metals, one to the other, with a mentally-powered cold fusion process. It's a very lightweight bond, of course, and also temporary since it only works during moments of intense concentration. The child should offer to do a demonstration at this time.

Slowly, he should push the paper clip directly over the hidden magnet and gently place the fork on top of it. The child should close his eyes, moan, take a noisy deep breath, hold it, and puff out his cheeks. The "magician" should next open his eyes, drop the magnetized leg away from the table, and very carefully lift the fork up. The clip will stick to it. The child should stand up and gently wave the fork and clip around for effect.

After a few seconds of demonstration, the child should exhale in a burst and simultaneously give the fork an invisible shake. The clip will drop loose. Bang the fork once against the table top (this is important) and then pass both the fork and clip around for inspection. The child doesn't have to worry since it won't work for anyone else.

Remember that a good magician never reveals his tricks. Only the youngster will know that by placing the fork and clip over the magnet he was able to "convert" them into magnets (albeit weak magnets). By rapping the fork on the table, the child has demagnetized it for everyone else.

There are lots of experiments in thousands of textbooks in schools across the country. The important thing for the teacher to keep in mind is that effort put into searching out the most exciting and stimulating experiments will be well worth it when you see eager, learning students in front of you.

If you would like to share some of your best classroom experiments, either join us on the CQ All Schools net on Tuesdays and Thursdays at 17:30 UTC on 28.303 MHz, where school kids and teachers from all across the country convene to share experiences, or write to me and send photos of your best times.

Please note that any enthusiastic and articulate youngster who is interested in being interviewed for the '93 Dayton Youth Forum should contact me by phone at (718) 983-1416, or by writing to me at P.O. Box 131646, Staten Island NY 10314. **RF**



computers in the shack

by Jeffrey Sloman N1EWO

Packet Operating Practice, Revisited

A few months ago, I talked just a little bit about packet radio operating practices. Since then I have been involved in a discussion with PBBS sysops and authors of the popular software packages that make the PBBS possible. The one thing they all seem to agree on is that you—the packet user—need to know more about operating packet. The frustration level of these guys is pretty high, but there are some things that you can do to help. The readers of this column have a unique opportunity: You are just starting out, so you've got a chance to start right!

Underneath all of the computer technology, packet is still just another way of communicating by radio. As with all other operating modes, having packet operations work as designed requires good operating practices by everyone sharing the band. Some of the operating practices are shared with all other modes—and are common sense. Others come from the special nature of the packet network's store-and-forward capability. To be a good packet radio citizen, you need to be aware of these operating rules and practice them in your use of packet.

No-Brainers

First let's look at the common-sense stuff. These are the kinds of things that apply, in one way or another, to every mode you will ever operate in.

Learn about packet before you start. I know it's tempting to jump right in and start transmitting, but remember: A packet station is effectively under automatic operation. Putting it on the air without having at least a little understanding of what you should expect it to do is not very responsible. You don't have to get an advanced degree in data communications; just read through the introduction in the manual and/or ask an experienced ham friend for a run-down. This also applies to changing TNC parameters from their factory default settings. You can really cause trouble for everyone on the frequency by setting these incorrectly—leave them alone unless you are certain you know what you are doing.

NOTE: Please don't interpret the above as an attempt to discourage experimentation! Please, experiment; but when you do, take precautions appropriate to your experiments. For example, use a quiet—or empty—frequency if you want to play with the TNC parameters to see what they do. Don't forget to write down the original settings so you can restore them if you get lost.

Be considerate of others who are sharing the frequency. Packet, by its nature, requires cooperation. Remember this when you make decisions about the behavior of your station. For example, a beacon (an automatically repeated transmission made by the TNC [Terminal Node Controller]) may or may not be acceptable in your area. Find out what local practice is and try to follow it. Sometimes you might reasonably differ with the local opinion, but it almost never pays to give others a hard time.

Try to pass on the help you got. Most likely, one or more other hams will help you get started in packet. This help can range from talking you through your station hook-up to loans—or outright gifts—of equipment. Put some of this energy back into ham radio by helping someone out when you get a chance. This isn't really a packet thing, particularly, but it is a ham thing.

Special Packet Operating Practices

When it comes to packet, many people instantly think of PBBSs (Packet Bulletin Board Systems). This is not surprising—traffic to and from these electronic mailboxes uses most of the network's available bandwidth (capacity). Because the packet network is basically a standard free-for-all once you get past the TNC, the store-and-forward capability of packet has grown all by itself—as opposed to being built. This means that there is a vacuum of consensus concerning just how one ought to behave when sending packet messages.

In the discussion I mentioned above, the one thing that stands out as the problem to fix is the addressing of packet messages. This is an area where *you* can really help. While sysops sometimes get the idea that users address their messages to ALL@ALLUS just to bother them, this is just not true—at least most of the time. ALL@ALLUS is problematic in two ways. If you want to make a positive impact on the packet network, think before addressing, and follow the guidelines below.

Start with local distribution. Don't just send your messages to ALL@ALLUS because it's easier. This is the one practice that is really clogging the packet network. Think about the content of your message—it is very likely that you would be just as well off sending it to a smaller group. For example, if you are looking for help with a piece of gear and you live in Boston, why not start off with a request on your local PBBS? It is very likely that you can get an

answer without sending your query to the four corners of the earth! If you used K1UGM as your home BBS, you might try:

(topic)@K1UGM

as the destination, where (topic) is a good identifier of the content of the message. Now, if you don't get an answer at home—expand the distribution. The next step might be:

(topic)@ALLMA

to send your question to all of Massachusetts. If you still don't get an answer (very unlikely, unless you are asking something really esoteric), then you can widen your distribution again.

Use the address and subject line to make the content of your message clear! The use of ALL in an address is just as bad as the use of ALLUS. How many messages addressed this way do you bother to read? Why would you? Thinking for a few seconds will get you to the realization that ALL is almost never appropriate. Instead, take the six characters that you can put into this field and do something useful with them.

For example, let's say our hypothetical query above is about a Yaesu FT-470. We want to know about the power output on 440. There are a couple of reasonable ways to send this message. First we could use:

FT-470@K1UGM

since FT-470 is pretty obviously referring to a Yaesu handheld, and any Yaesu owners would easily recognize it. Another reasonable choice would be:

YAESU@K1UGM

This way, readers interested in Yaesu radios would notice and get interested. Choosing a good topic is just half the battle, though. You've got to pair it with a good title to get the people who can help to read your message. In our example, we want to know the power output on 440. We've got 30 characters to get someone's interest. This is really not too hard. We could use:

FT-470 Power output on 440?

with the YAESU@K1UGM and have four characters to spare! Or, if we had used the first topic (FT-470), a simple:

What is power output on 440?

would get the same result. The WRONG way to do this—all too common—is something like:

ALL@ALLUShandheld power

You can see why 99.9% of your potential help would give this message a skip or, if they are like me, read it to unravel its mystery—then ignore

it for wasting their time.

When in doubt, leave it out. In general, a good rule to follow. In packet this means several things. The longer your message, the more traffic that gets forwarded. Your extra 100 characters may seem insignificant, but you are only one ham; if 1,000 people figure the same thing, look out! This DOES NOT MEAN that you should be cryptic, just concise. Say what you mean without a lot of verbiage. You can often eliminate lots of words without losing meaning. It helps if you compose your messages offline, in a text editor or word processor. This way you get a chance to think.

Another candidate for "leave it out" is the flaming message. Some hams seem to think that they are appointed to rid the world of X, where X is whatever every other ham is doing wrong. Resist the temptation to become ham radio's savior—you can't do anything but annoy almost everyone else. If you think you see a genuine problem, there is nothing wrong with composing a thoughtful, reasoned message about it and what you think might be the solution. If you make this interesting to read you are helping rather than adding to the problem. On the other hand, you are likely to get flaming messages in response, so be prepared. The flip side of this situation is responding to the dingbats who don't really care if they are bugging everyone else. If you notice that somebody is a bit off, so will 'most everyone else. Let it drop—your response is just likely to fan the flames.

The last "leave it out" thing I want to mention is re-transmission. Many (very well-meaning) hams find what they think are interesting (and often very long!) pieces of data from other sources, like landline BBSs and books. They then proceed to pass this information on to their fellow hams as packet bulletins. This is not a good idea. It takes up lots of bandwidth and disk storage space. Note that this is different from answering someone's request for information. If you really can't resist posting this stuff, talk to your local PBBS sysop about putting it in his download library.

Use Your Brain

I hope that this month's column has started you thinking about how you can help make packet radio a better place. I can't possibly put an exhaustive list in this small space, so I leave you with this thought: Use your own common sense to decide how to behave on packet. While some of this stuff may not be obvious to you if you don't have a background in packet radio, as you learn you will see opportunities to apply the principles discussed here. I have a lot of faith in the ability of new hams to help make ham radio an even better place—you are, after all, ham radio's future. Have fun and learn.

You can reach me in several ways: via a letter to *Radio Fun*; at N1EWO@N0ARY.#NOCAL.CA.US A.NA (for pleasantries only, no magazine business); at jsloman@mcimail.com on the Internet (my preferred address); or at jsloman on BIX and WIX 71221,1143 on CompuServe (my least favorite way to get mail). RF

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RF kit review

Ramsey AA-7 All-Band Active Antenna

by David Cassidy N1GPH

So... you've never built a kit before, but you'd sure like to try it. You've tried a couple of kits, or maybe tried building something from plans in a magazine, but have ended up with a modern art sculpture instead of a working circuit. Maybe you're an old hand at solder-flinging and you'd just like a nice, easy, one-evening project that would provide you with a useful shack accessory. The Ramsey AA-7 Active Antenna kit will please all of you described above, and then some.

Let me admit at the outset that I am perhaps the world's worst kit builder. My sol-

der joints look like toothpaste, I'm always losing the small parts and more often than not I end up with a non-working circuit. The instructions that come with many kits often leave me wondering what to do, and I inevitably make the wrong choice. I have a very large box filled with non-working projects that attests to my lack of prowess as a kit builder. Though many writers say it, in my case it is true: If I can build it, *anyone* can build it! That's why I enjoyed the AA-7 kit so much. I spent a pleasant Saturday morning, didn't burn myself on the soldering iron, and I ended up with a nice

completed project before the coffee ran out. What more could you ask for?

What is an Active Antenna?

Without going into technical detail, an active antenna can be defined as an antenna—usually quite a bit shorter than would normally be used for a given frequency—connected to an RF preamplifier and then to your receiver. The RF preamp is a low-noise impedance transformer, matching the high impedance of the whip (or other) antenna to the low impedance radio input, thereby "boosting" the received signal be-

fore it goes to your receiver. Some RF preamps are broadband, which means they will work on a wide frequency range. Other RF preamps are designed to be used on one specific frequency, and a third type are tunable, allowing you to peak the received signal for the frequency you're monitoring. The Ramsey AA-7 is of the broadband type, and like most preamps it is designed for receive only. Preamps can be designed for transmit, but these are usually quite expensive and require more complicated circuitry.

The Ramsey AA-7 incorporates two RF preamps, which are switchable via a front panel switch. With the power off, the preamp is taken out of the line, so you can leave the AA-7 permanently installed on your scanner or shortwave receiver and have non-amplified access to the external antenna jack or whip antenna. With the power on (supplied by a 9-volt battery), you have a choice of two RF preamps. One is optimized for HF applications, and the other gives excellent VHF-UHF perfor-

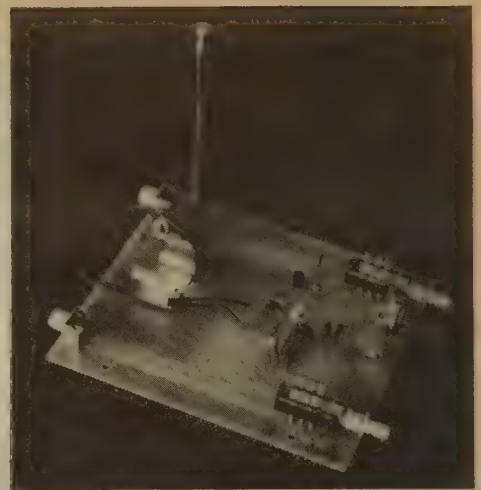


Photo A. The completed AA-7 circuit board.

mance, especially if you also adjust the length of the on-board whip antenna for best reception.

Building the AA-7

One of the best things about building a Ramsey kit is the instruction manual. Even a simple kit like the AA-7 comes with a 12-page manual that gives you a little

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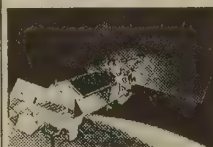


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bit of the theory of operation and then step-by-step instructions on building the kit. Anyone who carefully reads each step should have no problem completing the kit.

The instruction manual leads you through the construction process, following the circuit path as you go. Whenever possible, this a great way to build a kit because you learn a lot about how the circuit works as you build it. I wish every other kit manufacturer would follow Ramsey's lead in quality manuals.

With the full-size parts placement guide on one side of your workbench, and the step-by-step instructions on the other, the AA-7 kit goes together in about an hour. You start with the antenna jack, then follow the circuit path, adding necessary parts as you go. When you get to the receiver jack at the other end of the circuit, all you do is add the battery and antenna and you're done! Each step of the instructions has you add a single component, whether jack, switch, capacitor or resistor. The exact value of each component is given (not just the part number), and how to identify that component (resistor color code, etc.). As long as you know how to make a good solder connection, I can't see how anyone would be unsuccessful at building the AA-7.

Testing and Installation

One of the reasons I recommend the AA-7 for beginners is that there is absolutely no testing. Wire up a coax cable, attach to your receiver and turn it on. If it works, you'll know immediately because you'll hear the difference in your receiver's speaker.

After wiring up a short piece of coax, I first tested my AA-7 on a hand-held scanner. This is a perfect application for the AA-7 because it allows for increased performance when you're stuck with an indoor antenna. Scanner buffs who like to take their hand-held scanner with them when they travel should be especially interested in this. I tuned in an active chan-

nel, adjusted the RF gain control for maximum signal, adjusted the length of the whip antenna, tweaked the RF gain one more time and that's it. The received signals are remarkably improved, especially when compared to the hand-held scanner's supplied antenna.

Next, I attached the AA-7 to my HF transceiver. (If you do this, make absolutely sure that you never key the transmitter. This will send power into the circuit and probably cook the transistors to a crispy, golden brown.) Even using the attached whip antenna gave fair results, much better than what you'd get from a portable shortwave receiver's whip antenna. When I attached

my 80 meter dipole to the external antenna jack of the AA-7, the results were truly astounding! Tune in a weak signal, hit the power on the AA-7 and voilà! Instant armchair copy! The possible applications for shortwave monitoring are numerous. Anyone who uses a portable shortwave receiver with the stock antenna should definitely build an AA-7. Even serious SWL DX chasers with outdoor antennas would benefit from installing an AA-7.

On the Case

The only disappointment experienced at all with this kit was in the accessory case, offered for an additional \$12 from Ramsey. The case comes with no instructions, and while it doesn't take a rocket scientist to figure out how the case goes together, a paragraph or two with an exploded view drawing would be nice (especially for first-time kit-builders).

The only other gripe I have with the case is that in order to use it you have to leave off the whip antenna. There's no provision for it, nor is there any

instruction on how to attach the whip once you've enclosed the circuit board in the case. Unless you modify the case somehow, you are forced to use the RCA jack on the back. To my thinking, this limits the usefulness of the AA-7 as a "throw it in your suitcase and go" active antenna.

To get around this, I plan on buying a whip with a right-angle swivel, mounting it on the side of the AA-7 case, and running a lead from the antenna to the point on the PC board where the whip should go. I suppose it would be a lot easier to simply solder an RCA plug to a piece of wire and wrap the wire around the case before throwing it in my suitcase, but I like the idea of a collapsible and swiveling whip. I also plan on adding a "power on" LED indicator, which the AA-7 instruction manual shows you how to do.

All in all, I think the AA-7 would make a great introduction to kit-building for any novice solder slinger. If you like to monitor shortwave broadcasts and public service frequencies while you travel (like I do), then the AA-7 is really a must. With the Ramsey case/knob kit, I have a rugged and very portable piece of equipment that dramatically improves the performance of my portable receivers. **RF**

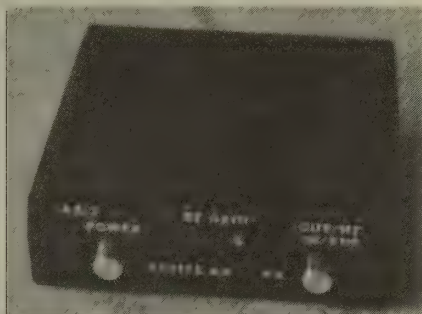


Photo B. Front view of the completed project, with the Ramsey accessory case.

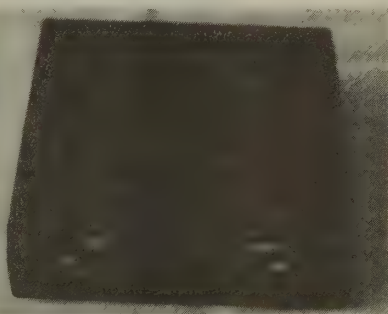


Photo C. Rear view of the AA-7 in the accessory case.

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by Gordon West WB6NOA

Learn From Your Antenna

Your Novice and Technician class examinations each contain three questions on antennas and feedlines. More than likely you had an examination question or two about yagi antennas and quad antennas. What do these two antennas have in common? That's right—both the yagi and the quad antenna are **DIRECTIONAL**.

The yagi antenna consists of half-wave linear elements mounted on a boom. The quad antenna features full-wavelength squares, attached to "spreaders," mounted on a boom. The longer the boom, the greater the gain; the higher the frequency, the smaller the elements. Also, both antennas consist of multiple directors, one driven element, and one reflector. The directors are approximately five percent smaller than the driven element, and the reflector is about five percent larger than the driven element. Remember all that when you were preparing

for Novice and Technician?

As a licensed radio amateur, you will regularly be working with directional antennas. On the worldwide bands, they can weigh as much as 100 pounds and have 20-foot arms and a boom over 30 feet long! Up on the 2 meter and 440 MHz bands most yagi antennas and quads are about 12 feet long, and their elements are generally less than three feet from tip to tip. The higher you go in frequency, the shorter the wavelength, and the smaller the directional yagi or quad gets.

Understanding gain and directivity is important. You can read about it all day long in books, but nothing beats practical experience in working with the directional antenna. There is plenty that you can do to learn about yagis and quads with your little single-band or dual-band handheld.

I recommend you start off with your antenna exploration using a quad. These are safe antennas

around a lot of onlookers. You are less apt to accidentally poke someone with a quad than you are with the pointed ends of a yagi antenna. The quad may also offer a slight improvement on gain.

During our classroom demonstrations, we use the pre-assembled quad antennas from Max System Antennas (106 Western Avenue, Essex MA 01929; 508/281-8892; Attn: Tom Burnie KØTB). Both their 2 meter quad and their 440 MHz quad are fully pre-assembled, and they go "on the air" in less than five minutes. No soldering is required—just get everything in place and you are ready for some experimenting.

Use your little handheld and rubber duck antenna to tune in a distant repeater that is coming in weak. Now switch over to the quad and

rotate it and see the improvement of signal strength on your radio's LCD bar graph signal-strength meter, plus hear the amount of additional "quieting" to the background noise. Swing the quad back and forth, vertically polarized, and notice that the **BEAM WIDTH** is about 10 degrees of either side of being pointed directly at the distant repeater transmitter. Now, swing the antenna approximately 45 degrees off of the direction of the repeater and notice the deep **NULL**. The signal should just about drop out completely. Keep rotating the antenna and notice how the signal comes back up again but never quite as strong as the **MAIN LOBE**. What you are picking up off of the side of the antenna are "**SIDE LOBES**." Now, turn the antenna exactly backward to the distant repeater. Again, the signal should barely be coming in.

Now turn the antenna so the feed-point is horizontal with the earth. That is, the wires coming out from the feedpoint are horizontal on that side of the quad. Notice how the repeater dramatically drops in signal strength when you turn the antenna horizontally. Even though the antenna is pointing right at the transmitting repeater, it's not as strong horizontally as it is vertically. This illustrates **POLARIZATION**. You can use this to your advantage if you're trying to "T-hunt" a signal that is so strong you can't find a

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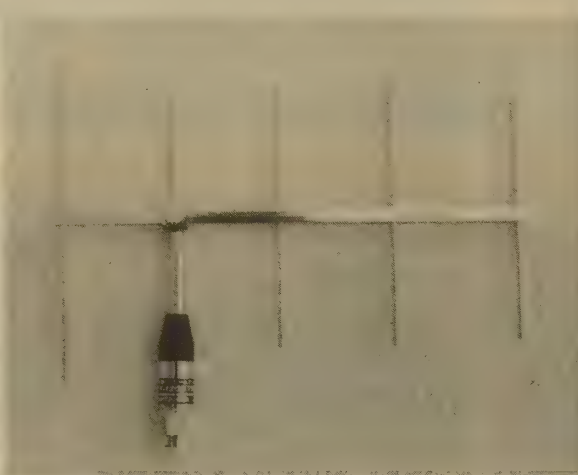


Photo A. A small yagi is a fun way to learn about beam directions.

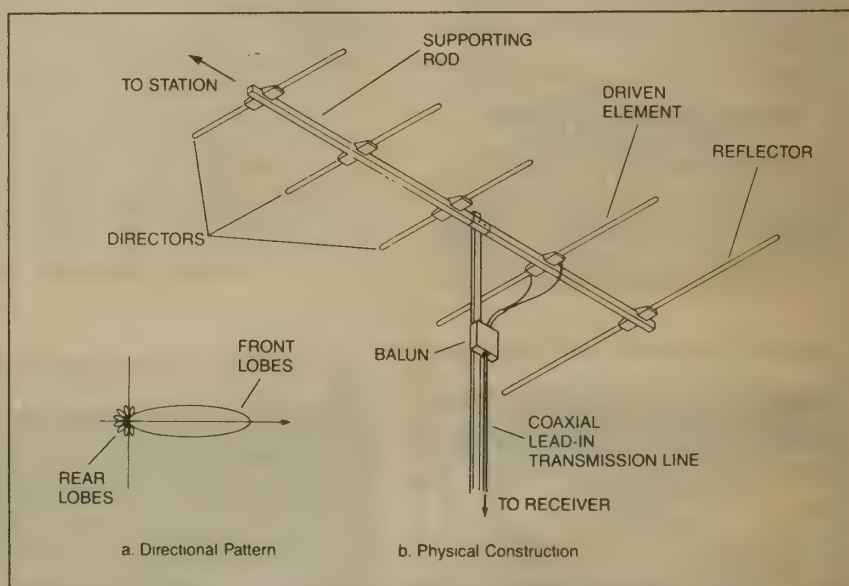


Figure 1. A beam antenna: the yagi antenna. Source: *Antennas—Selection and Installation*, 1986, Master Publishing, Inc.

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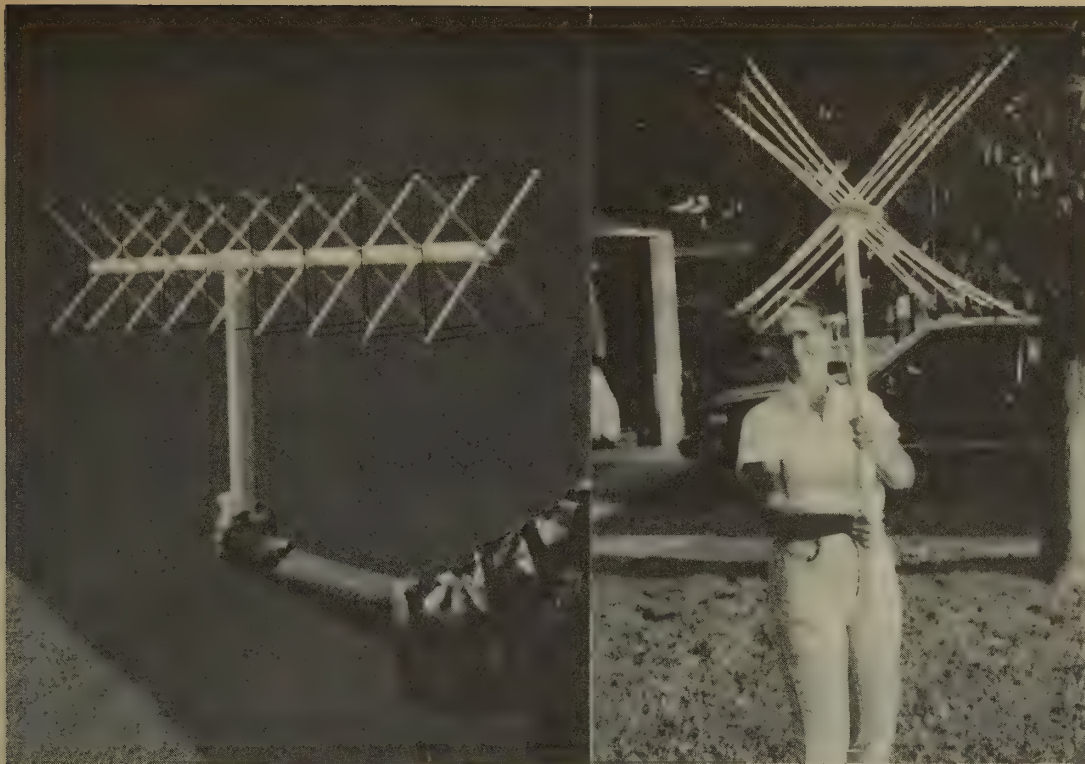


Photo B. The 2 meter quad (right) is larger than the 440 MHz quad (left).

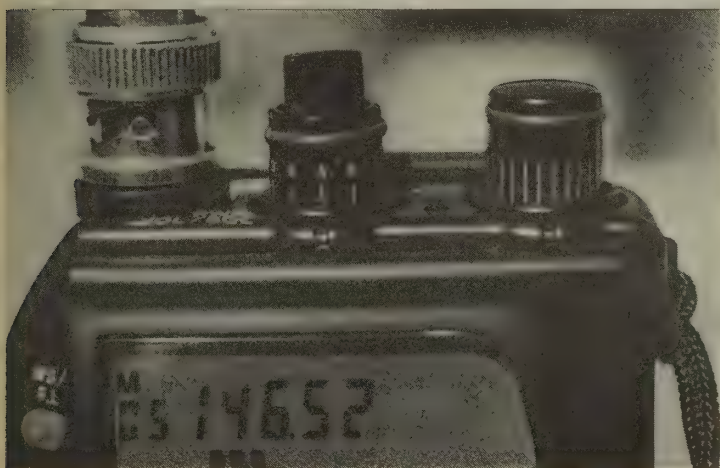


Photo C. Watch the LCD bar graph (below the frequency readout) for the signal strength readout as you rotate the yagi or quad antenna.

NULL. Go horizontal, and the signal strength should be a lot lower, and you might be able to see a NULL on your LCD signal-strength meter.

Next, go inside your house and see what happens to your antenna's DIRECTIVITY. Yikes—you move it all around, and it doesn't seem to be directive at all. What's going

on? REFLECTIONS from the house wiring, aluminum siding and other metal throughout your house are probably causing the signal to be reflected in many directions. This is why you must be IN THE CLEAR to take accurate heading directions.

If you have a 440 MHz handheld, try picking up a reflected signal off

of a passing jet. When you hear a rapid flutter, this is signal reflection at its best. Occasionally, the reflected signal with its rapid flutter may even be stronger than the direct signal!

You can use the quad to track down interference from home electronics on the 2 meter or 440 MHz band. Interference is usually the sound of a "dead carrier" right on your favorite repeater channel, and the only time you hear it is when you bring your handheld into the house. Chances are you can track down the "dead carrier" to a tiny emission from a telephone answering device, FAX machine, personal computer, or even those ultrasonic flea repellers that plug into the wall. Your little quad will turn you into a real detective.

So do consider the quad an educational antenna as well as a practical one. What you can learn from a small 2 meter or 440 MHz quad will apply to all the things you may need to know when you start putting up that big five-element triband beam antenna on an 80-foot tower. The small quad is quite educational! **RF**

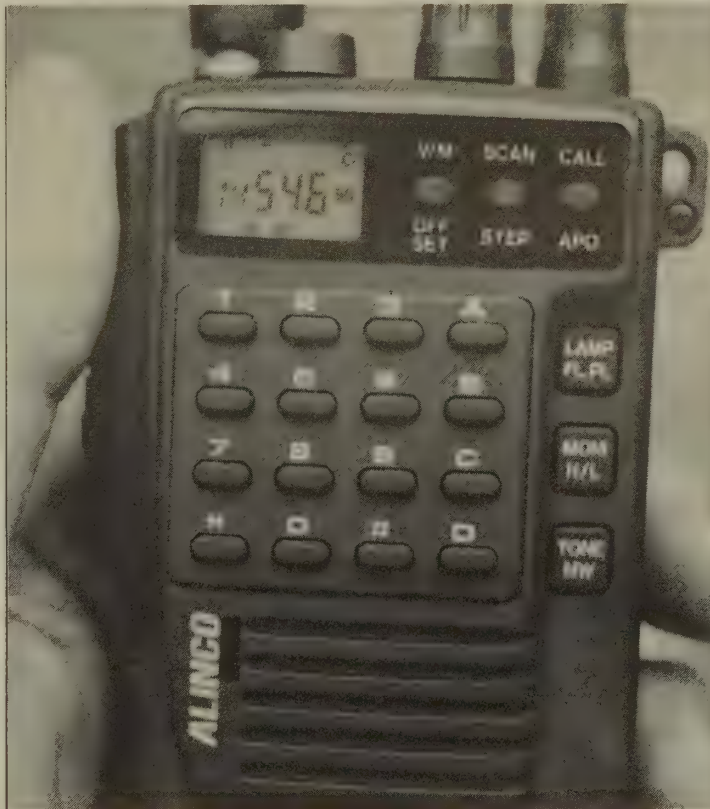
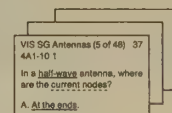


Photo D. You will hear the difference on your handheld when you rotate any loop or yagi off of the main incoming signal.

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Kitt Peak Radio Observatory

Seeing the world with the shortest radio waves.

by Roald Steen AJØN/LA6US

Millimeter radio waves are at the shortest end of the radio bands. The Kitt Peak Radio Observatory in Arizona was the first radio telescope constructed to look at the universe at millimeter wavelengths.

Kitt Peak was selected for this observatory because of its elevation—around 6,000 feet. Millimeter radio waves are attenuated during their travel through the atmosphere. This attenuation is reduced at a mountain site like Kitt Peak.

Also, much of the atmospheric attenuation of millimeter radio waves is caused by water vapor in the atmosphere. The atmosphere at the Kitt Peak site is relatively dry so water vapor attenuation is maintained at a low level.

Kitt Peak is operated by the National Radio Astronomy Observatory. This organization also operates the Very Large Array, composed of 27 individual antennas, in New Mexico, and the radio observatories at Green Bank in West Virginia.

The Reflector

The diameter of the Kitt Peak reflector antenna is 40 feet. Most radio observatories are bigger; however, a radio observatory must have a reflector which is very smooth compared with the wavelength it is observing. A radio observatory working at longer wavelengths can easily be made bigger, but it was a challenge to build a 40-foot disk with the smoothness that is required for

millimeter wavelength observations.

The resolving power of a radio telescope is proportional to the size of the observatory and the wavelength at which it is observing. Since the millimeter waves are so short, the Kitt Peak Radio Observatory can resolve distant objects better than many larger radio observatories operating at longer wavelengths.

The Kitt Peak Radio Observatory was built in 1967. Its reflector surface was then 36 feet in diameter. A later improvement resulted in the present 40-foot antenna. The new reflector antenna was built from materials that have similar thermal coefficients of expansion. This is important because metals with different coefficients of expansion could cause the reflector to become somewhat distorted during changing temperatures.

The Kitt Peak Radio Observatory is built in the so-called Cassegrain Configuration. A radio telescope with this configuration has a subreflector which receives the radio waves from the main reflector and directs these radio waves towards receiving equipment located at the center of the main reflecting disk. The Cassegrain Configuration is the most practical configuration for many radio observatories because it is difficult to support the heavy receiving equipment in a stable manner at the focus of the main reflector.

All electronic components develop some internal noise when they

are working in a circuit. Most of the internal noise is caused by thermal noise in the materials from which the components are made. At room temperature, this thermally-produced noise would overwhelm most of the weak signals that are being received from space. The receiving equipment at the Kitt Peak Observatory is therefore cooled with liquid helium. Liquid helium as a coolant maintains a temperature of only a few degrees above absolute zero.

The movement of the observatory towards objects in the sky is under computer control. The objects must be tracked as they move across the sky due to the rotation of the earth, and this function is also controlled by the computers.

Waveguides are used to conduct the signals which the Kitt Peak Radio Observatory picks up from space to the control building, where the signals are processed by powerful computers. The output from the computers can be in the form of color images, almost as if one were observing the sky with radio eyes. In these color images, different colors indicate different intensities or frequencies in the received radio signals.

The signals can also be transformed into graphs and statistics. Much of the information is recorded on magnetic tape so that scientists can study the information after the observations have been completed.

The water vapor content over Kitt Peak varies throughout the year. It is highest during the summer, so the summer months are usually used for maintenance, calibration and testing of the observatory.

The moon and the planets are conspicuous objects at millimeter radio wavelengths. The Kitt Peak Radio Observatory has been used to map the millimeter radio waves that these objects emit.

The spiral structure of nearby galaxies has been mapped at mil-



Photo B. The Kitt Peak Radio Observatory, seen from the air.

limeter wavelengths by the observatory. Galaxies that are conspicuous at other wavelengths, such as the galaxies that emit radio jets, are also prominent at millimeter wavelengths.

Many molecules have, in recent years, been found in space between the stars in our galaxy. Most of these molecules have been discovered due to their millimeter wave radiation. The Kitt Peak Radio Observatory has been prominent in detecting and mapping millimeter radio waves from molecules in interstellar space.

Optical astronomy also benefits from the dryness and low atmospheric

attenuation at Kitt Peak so there are also several optic telescopes near the Kitt Peak Observatory.

The Kitt Peak National Observatory, which operates the optical telescopes at this site, includes a visitors' center on the mountaintop. The site can be reached by car. An exhibit at the visitors' center is devoted to the Kitt Peak Radio Observatory. This exhibit shows how the radio telescope is constructed and the principles behind its operation. The exhibit also includes a presentation on the research which is conducted at the Kitt Peak Radio Observatory. RF

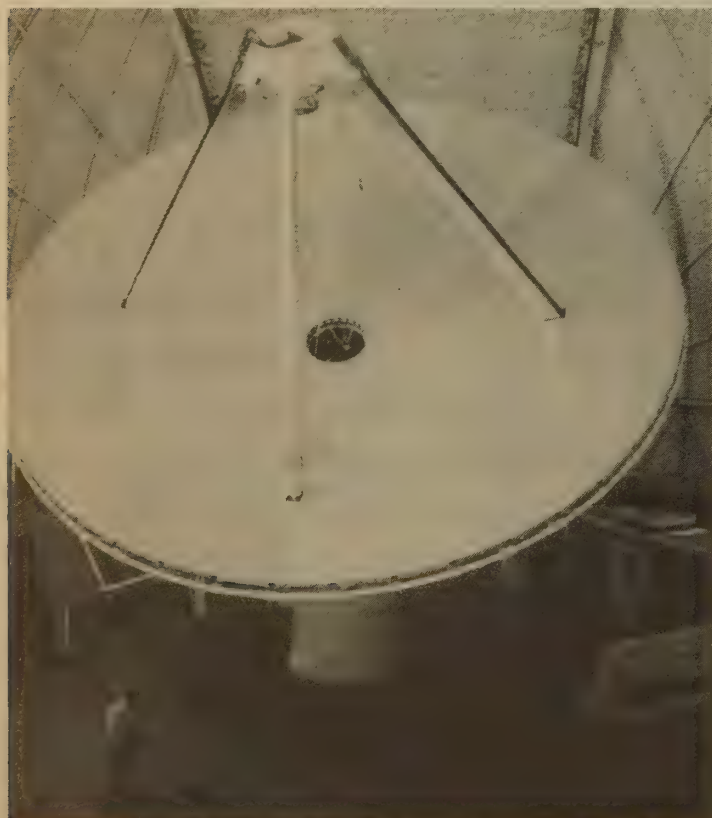




Photo A. The 40-foot parabolic reflector of the Kitt Peak Radio Observatory. A subreflector in front of the parabola directs the signals from space towards receiving equipment at the center of the parabola.



Photo C. The control room.




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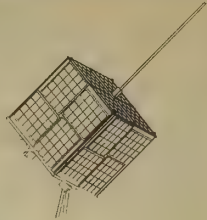
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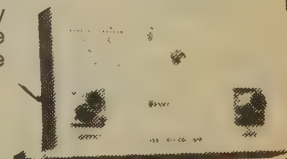
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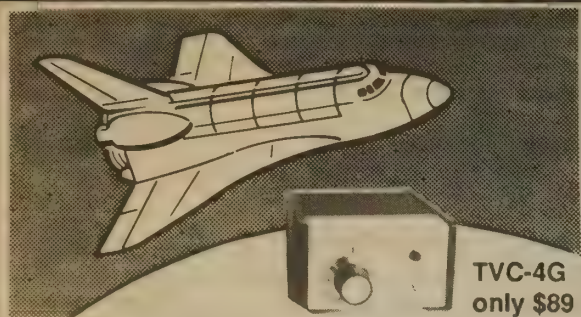
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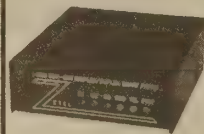
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CIRCLE 55 ON READER SERVICE CARD

activities calendar

Send your announcements to: Radio Fun Activities Calendar, 70 Route 202-N, Peterborough NH 03458. We'll print as many as space allows, on a "first come-first listed" basis.

FEB 2

ROANOKE, VA VE Exams will be held by the WCARS for upgrades only, at Hollins College at 8 PM. Pre-registration only. Contact Fred L. Horton KZ4Y, (703) 366-6266, or Ben Giavaden N4BG, Route 7, Roanoke VA 24022.

FEB 6

HAMPTON ROADS, VA Sign up for Hampton Roads Radio Ass'n's W5YI Exams. Please contact Bill Runyon N4BDH, (802) 487-8611, for details.

KNOXVILLE, TN WCARS VEC Exams, for upgrades only, will be held in Room B-129 at Pellissippi State Tech. Comm. College, Pellissippi Campus, at 10 AM, 10:20 AM, and 10:40 AM. Written elements at 11 AM. Please pre-register. Contact Ray Adams N4BAQ, (615) 688-7771, or Rich Slover ND4F, (615) 539-4821.

PARIS, TN Henry County H.S. will be the location for WCARS VEC Exams at 9 AM. Call Mackie Gallimore AA4YF, (901) 247-5489, or Les Merrell KQ4F, (901) 642-5966.

ST. CATHARINES, ONT., CANADA The Niagara Peninsula ARC Inc. will hold a Hamfest and Dinner-dance at the C.A.W. Hall, 124 Bunting Rd. Talk-in on 147.24/84. Dinner-dance tickets by advance only. For info, please write N.P.A.R.C. Inc., P.O. Box 692, St. Catharines, Ont. L2R 6Y3, Canada. Tel. (416) 934-3231, or VE3KLM@VE3SNP.

FEB 8

MARYVILLE, TN WCARS VEC Exams will begin at 7 PM at St. Andrews Church Hall, W. Broadway. Contact Carroll Peabody W4PCA, (615) 982-5839 for details.

FEB 13

GOSHEN, NY The Orange County ARC Computer Fair/Winter Hamfest will be held at John S. Burke Catholic H.S. on Fletcher St. Talk-in on 146.760-600, plus 100 Hz tone. For more info, call Jim Capicotto, (914) 564-2707.

MARION, NC VEC Exams by WCARS will be held at Asheville Federal Bank Bldg., Main St. Contact Cecil D. Potter WB4UCF, (704) 724-4007.

WEST MEMPHIS, AK WCARS VEC Exams will be held at 9 AM at Rosewood United Methodist Church, 2303 E. Barton Ave. Get details from Gene Bagley AB5BL, (501) 739-4029 or Rev. Richard Gregory AB5CH, (501) 735-4060.

FEB 14

JASPER, TN WCARS VEC Exams will be held (by pre-registration only) at 1 PM at Jasper Public Library. Contact Charles Wooten KD4XX, (615) 942-5116, or Wallace S. Brown KD4XV, (615) 942-2836.

MANSFIELD, OH The Mansfield Mid-Winter Hamfest/Computer Show will start at 7 AM at the Richland Cnty. Fairgrounds. Advanced Ticket/Orders must be received and paid by Feb. 1st, 1993. Talk-in on W8WE 146.34/94 rptr. Contact Dean Wrasse KB8MG, 1094 Beal Rd., Mansfield OH 44905. Tel. (419) 589-2415 after 4 PM EST.

FEB 20

CHARLESTON, SC The Charleston ARS, Inc. will hold their Hamfest in the Geodesic Dome at Charleston Landing, 1500 Old Town Plantation Rd., from 8:30 AM-4 PM. Talk-in on 146.19/79, 144.65/145.25, and 147.87/27 MHz. Walk-in VE Exams will be given on the campus of Trident Tech. College at 11 AM. For Exam info, call (803) 871-4368 or (803) 572-1164. For Hamfest details, call Jenny Myers, (803) 747-2324, or Linwood Sikes, (803) 556-5566.

COLUMBIA, SC The Red Cross Bldg., Bull St., will be the location for WCARS VEC Exams at 8:30 AM. Get details from Ray Rogers N4WR, (803) 345-3373.

NEW ALBANY, IN WCARS VEC Exams will be held in Room 204, Knob View Bldg., Indiana U. South, Grant Line Rd., from 10 AM-2 PM. Contact Dick Truax KBGVU, (812) 246-6377, or "Mac" McCrory NM9A, (812) 944-6661.

SALEM, OR The Salem and Oregon Coast Emergency Repeater Assns. will sponsor their 1993 Ham Fair at the Polk Cnty. Fairgrounds, beginning at 9 AM. Talk-in on 146.26/86. For more info, write to: Salem Repeater Assoc., P.O. Box 784, Salem OR 97308.

FEB 21

ASHEVILLE, NC WCARS VEC Exams will take place at AB Tech Room 134, Elm Bldg., at 2 PM. Get details from Harry Dull AA2AB, (704) 891-5481 or Don Lovelace W4TMT, (704) 765-5311.

DEARBORN, MI The Dearborn Civic Center will be the location for the Annual Swap 'n Shop sponsored by the Livonia ARC. Doors open from 8 AM-4 PM. VE Exams in the afternoon. Talk-in on 144.75/145.35 and 146.52 simplex. For more info, send 4 x 9 SASE to Neil Coffin W4GWL, Livonia ARC, P.O. Box 2111, Livonia MI 48151. Tel. (313) 427-3905.

NEW HYDE PARK, NY A Hamfest, sponsored by the Long Island Mobile ARC, will be held from 9 AM-4 PM at the Nassau County Police Activity League, 375 Denton Ave. Talk-in on 146.25/85. For further info, please contact Neil Hartman WE2V, (516) 462-5549.

ROCK ISLAND, IL The 22nd annual Davenport (Iowa) ARC Hamfest will be held at the QCCA Expo Center. Large indoor Flea Market. Talk-in on the WOBXR 146.28/88 rptr. Advance payment deadline is Feb. 15th.

Contact Al Broendel N9OK, 2712 38th St., Rock Island IL 61201, for Exam details; or Talk-in on the WOBXR 146.04/64 rptr. For Hamfest info, contact Kent Williams K9UQI, 4245 10th St., East Moline IL 61244.

FEB 27

DALTON, GA WCARS VEC Exams will be held at 3 PM at Unity Baptist Church, Burleson Rd. No walk-ins. Contact Bert L. Coker N4BZJ, (706) 259-5625 or Harold W. Jones N4OTC, (706) 673-2291.

FEB 27-28

CINCINNATI, OH The ARRL 1993 Great Lakes Div. Convention will be held from 8:30 AM-5 PM (both days) at the Cincinnati Gardens Exhibition Center, Seymour Ave. and Langdon Farm Rd. Advance deadline is Feb. 17th. Contact Stan Cohen WD8QDQ, (513) 531-1011, or Joe Halpin W8JDU, (513) 851-1056.

MAR 6

ABSECON, NJ The Shore Points ARC will sponsor "Springfest '93" at Holy Spirit H.S. on Route 9. Doors open at 9 AM. Talk-in on 146.385/985. For more info, write to: SPARC, P.O. Box 142, Absecon NJ 08201.

MAR 7

CUYAHOGA FALLS, OH The Cuyahoga Falls ARC 39th Annual Hamfest will be held at the St. V. Center, 3479 State Rd., from 7 AM-3 PM. Talk-in on 87/27. Get details from Bill Sovinsky K8JSL, 2305 24th St., Cuyahoga Falls OH 44223. Tel. (216) 923-3830.

NORTHAMPTON, MA A Hamfest will be held at Smith Voc. School, Rte 9, by the Mt. Tom ARA, beginning at 9 AM. VE Exams at 10 AM. Pre-register by calling (413) 245-3228. Talk-in on 146.34/94. Get details from Jim KIMEA, 316 Main St., Easthampton MA 01027. Tel. (413) 527-3199, 7-9 PM.

MAR 13

FARGO, ND Hamfest '93, from 8 AM-3 PM, will be sponsored by Red River Radio Amateurs at The Bowler, 2630 S. Univ. Dr. Talk-in on 146.16/76. Ask about Banquet tickets. Contact RRRRA, P.O. Box 3215, Fargo ND 58108-3215. Tel. (218) 233-2584 7 PM-10 PM.

SPECIAL EVENT STATIONS

FEB 6-7

NORTH CENTRAL, WI A group of hams will operate KP9MG on 28.360, 21.360, 7.260 and 38.860, to commemorate the 1993 Badger State Winter Games. For certificate, send QSL and large SASE to Mike KA9VFP, 1104 E. Lieg Ave., Shawano WI 54166.

FEB 13-14

CONCORD, NH The Contoocook Valley RC will celebrate the Grand Opening of the KIBKE Club station, at the Christa McAuliffe Planetarium during the New Hampshire QSO Party. Tune in on the 80-100 meter bands. For QSL, send a #10 SASE to Contoocook Valley RC, P.O. Box 88, Henniker NH 03242.

FEB 13-15

1993 NEW HAMPSHIRE QSO PARTY The NH ARA will sponsor this event from 1900 UTC Feb. 13th-0700 UTC Feb. 14th, and from 1400 UTC Feb. 14th-0200 UTC Feb. 15th. Open to all license classes. For more details, write to G.E.A.R.S., Conrad Ekstrom WB1GXM, P.O. Box 1076, Claremont NH 03743-1076.

FEB 19-21

MARQUETTE, MI The Hiawatha ARA will operate N8GBA from 1700Z Feb. 19th-1700Z Feb. 21st, to honor the UP 200 Sled Dog Championship. Use the lower end of the 10, 15, 20 and 40 meter phone bands. For a certificate, send a large SASE (with 2 stamps), to Richard Schwenke N8GBA, 21 Smith Ln., Marquette MI 49855.

FEB 20

BREMERTON, WA The North Kitsap ARC of Washington, will operate K7SXL at the Olympic College in conjunction with VoTech Week. Operating hours are from 1600Z to 2400Z. Frequencies: CW—3.65/69, 7.04/08, 14.04/08, 21.04/08, 28.025/075 MHz; SSB—3.84/88, 7.24/28, 14.24/28, 21.34/38, 28.44/48 MHz. Send QSL with SASE to North Kitsap ARC, P.O. Box 2268, Silverdale WA 98383-2268.

FEB 25-28

BROWNSVILLE, TX The Faulk Intermediate School ARC will operate N5SMH from 1400Z-2200Z, to commemorate the annual Charro Days Festival. Tune the General portion of 40, 20, 15, and Novice portion of the 10 meter bands. For Certificate, please send a QSL and SASE to Faulk Intermediate ARC, 2200 Roosevelt, Brownsville TX 78521.

FEB 27-MAR 2

HUNTSVILLE, TX The Huntsville ARS will operate WASSAM from the campus of Sam Houston State U., from 0000Z Feb. 27th-2400Z Mar. 2nd, during the celebration of General Sam Houston's 200th birthday. Frequencies: Lower portion of the HF General phone subbands, and the Novice 10m phone subband. For a 3-color Certificate, send QSL and a 9 x 12 SASE; for a QSL card, send QSL and SASE, to HARS Special Event, P.O. Box 7516, Huntsville TX 77342-7516.

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Continued from page 14

Direct Digital Synthesizer

Another feature to look for in your new radio is DDS, or a Direct Digital Synthesizer. A Direct Digital Synthesizer allows very fine tuning rates, usually down to 1 Hz. This slow tuning rate is needed when operating digital modes such as HF packet or AMTOR. The December 1992 and January 1993 issues of 73 *Amateur Radio Today* describe a simple Direct Digital Synthesis rig for QRP use. Check it out!

So, the choice is yours. Only you know what you can afford and only you can say for sure what kind of rig you want. There's more to ham radio than just CW and SSB, so look over the options of using digital communications. This may include full QSK (full break-in) to special "digital mode" filters. Are you a member of MARS or thinking of becoming a member down the road? If so, then look for a rig that will allow operation out of the normal ham bands. You may have to do a simple modification yourself to the rig or pay to have it done. Just be sure the rig will work out of band for MARS and CAP use.

How about getting the rig repaired when it breaks? Most of the solid-state microprocessor rigs are beyond most of us to fix ourselves. The use of surface-mount components and special ICs leave little to be fixed by most hams. Keep this in mind when going for the best price. It might be cheaper in the long run to pay a little bit more for the rig from a dealer who will repair it in-house than to send it across the country to a national repair depot. Gordon West WB6NOA did a very complete service survey on the major radio manufacturers in 73 *Amateur Radio Today* a year or so ago.

No one radio is better than another; the difference is mostly in features you like and how they are used. Personally, I like Ten-Tec rigs. Always did, always will. They're easy to fix if they get sick, and if I'm in a spot with one a call down to the factory will usually solve the problem. Many times a board swap at no charge will fix the problem with a Ten-Tec rig. Ten-Tec's QSK is the standard which others are compared to. It's a CW op's dream rig.

Many of my friends contest and contest very heavily. They prefer the Kenwood models. Ease of use and operating performance, as well as style, make Kenwood a very popular choice. Kenwood has a service manual for all their rigs to help in their repair.

If you chase DX and read about DXpeditions, then you know all too well ICOM has many choices to choose from. I find ICOM rigs a bit easier to repair and get parts for than some of the other ones. ICOM has a very, very intensive line of accessories for all of their rigs.

But when I think of working SSB, my thoughts go back to the time I helped operate the World Wide DX contest and I operated a Yaesu FT-101ZD. Smooth, clean operation with an audio punch that put QSOs in the logbook. Yaesu also makes the only (that I know of) 2 meter rig to meet Mil specs!

I hope some of this will help you in picking out a new rig. Sometimes the best thing to do is ask a friend who has one if you can spin the knobs. Don't let one bad report sour your thinking. There's going to be a bad apple in everyone's basket at some time. Keep an open mind when asking around. **RF**

Operation Holidays II

Continued from page 1

handlers' skills at optimum levels—skills that are developed for use in times of public emergency or disaster.

You, the amateur, and your radio club have an obligation to the public which is served by amateur radio. Only an informed public, using the services available to them, will know that amateur radio is an important service. Only an informed public can help to protect the amateur bands from being

usurped by other potential users. Only an informed public can make legislators and regulators see the value of amateur radio as a national asset.

Only you, the amateur community, can get the word out to the public. Act now! Talk to your family, your friends, your neighbors, your civic leaders. Write letters to editors. Submit new items. GET INVOLVED. The future of amateur radio may well be in your hands. **RF**

Youth Forum Interviewees Needed

Carole Perry WB2MGP is seeking articulate, active amateur radio youngsters up to age 18 to be interviewed for various youth

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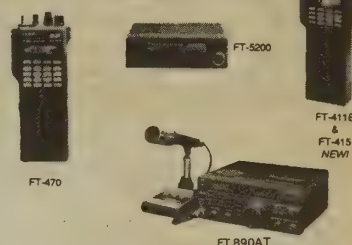
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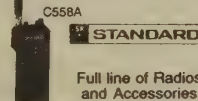
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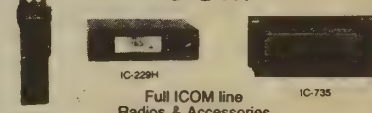


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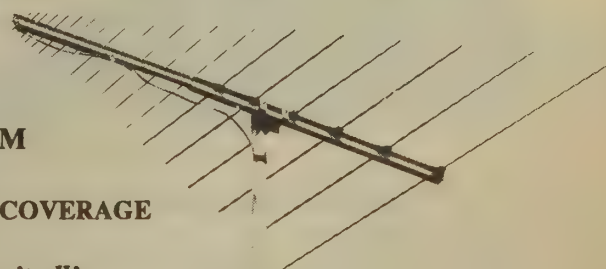
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Radio Fun flea market

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The *Radio Fun Flea Market* costs you peanuts (almost)—comes to 10 cents a word for individual (noncommercial) ads, and 70 cents a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad. This is a monthly magazine, not a daily newspaper, so figure a couple of months before the action starts; then be prepared. If you get too many calls, you priced it too low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right, and maybe you can help make a ham newcomer or retired old-timer happy with that rig you're not using.

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new products



STARTEK INTERNATIONAL

The new model ATH-15 from Startek International is a frequency counter/frequency finder with an instant-reading RF signal-strength bar graph in a pocket-size aluminum cabinet. The fast response time and ATH™ (automatic trigger and hold) feature on this unit offer a distinctly new and improved feel to the operation of a portable frequency counter. The ATH-15 can read frequencies from 1 MHz to 1500 MHz, and the 10-segment 2"-long LED bar graph can give an instant RF signal-strength indication from signals below 1 MHz to over 4 GHz. There are two ranges with three selectable gate times on each range; maximum resolution is 10 Hz. The new ATH feature elim-

inates random counting and false readings. The response time from the beginning of the input signal to a stable accurate display has been dramatically reduced up.

The ATH-15 comes with factory-installed NiCd batteries. It is housed in a rugged, attractive black anodized aluminum cabinet measuring 3.5" x 4" x 1", and weighing about nine ounces. The ATH-15 is \$235, the CC-90 case is \$12 and the TA-90 antenna is \$12. For more information, contact *Startek International, Inc.*, 398 N.E. 38th St., Ft. Lauderdale FL 33334; (305) 561-2211, (800) 638-8050, Fax: (305) 561-9133. Or circle Reader Service No. 201.

JAN CRYSTALS

JAN Crystals has published a new catalog of quartz crystals and holders. This illustrated eight-page booklet contains descriptions, specifications and prices on crystals for frequency control, microprocessors, data transmission, tele-

metry and telecommunication voice.

The catalog is free. Contact *JAN Crystals*, P.O. Box 06017, Ft. Myers FL 33906-6017; (813) 936-2397, (800) JAN-XTAL. Or circle Reader Service No. 202.

OAK BAY TECHNOLOGIES

OAK BAY TECHNOLOGIES has announced a companion product to their UNI-Cable™ Universal Packet TNC/Transceiver cable line. The CA-232HH now provides the same universal solution for TNC-to-handheld cabling. The CA-232HH will virtually interface all popular TNCs to all popular handhelds that use the 2.5mm and 3.5mm microphone and earphone jacks. The CA-232HH was designed specifically for easy installation and configuration—its ability to be reconfigured to fit any of the popular TNCs and handhelds eliminates the need to purchase a different cable each time you change radios or TNCs. The installation requires no soldering.

The CA-232HH comes complete with the main interface unit, interface cables for the handheld, and easy-to-follow instructions. The list price is \$34.95 and the product is warranted for one year. For more information, contact *Oak Bay Technologies, Inc.*, P.O. Box 65494, Port Ludlow WA 98365; (206) 437-0718. Or circle Reader Service No. 203.



G & P ENGINEERING

G & P Engineering has announced a new style of antenna mounting system called the "N-PAM" unit. The N-PAM unit will mount on the roof without drilling holes into the roof. It will mount on any roof at any pitch from flat to a 12/12 pitch, and will allow use on roofs with 16" o.c., 24" o.c., stick-built or truss systems. Basic systems include single or dual tray units with a 2" mast 3' high—ideal for a tribander/VHF-UHF system. Options include a 5' or 7' mast. The 7' mast can be used with the largest OSCAR antenna system or stacked yagis.

All mounts are made of steel and are primed and painted with a durable and hard epoxy paint, black, to blend with most roof shingle colors. For prices and more information, contact *G & P Engineering*, 4943 Finch Court, Stephens City VA 22655; (703) 869-4530, Fax: (703) 869-5116. Or circle Reader Service No. 204.



RF vintage review

The Yaesu FT-102

by Avery L. Jenkins WB8JLG

Just as the day of the completely home-brewed station has passed, the era of the single-purpose rig has become history. Where once a ham might have had his CW rig for one band and a phone rig for another, today those functions have been integrated into one package. And as technology progresses, more and more functions can be squeezed in.

The Yaesu FT-102 is a perfect example of just how multi-model today's radios are. This new Yaesu has more modes and filters than Elmer had crystals, which makes it useful for the average ham—the one who sometimes contests (but doesn't necessarily win), sometimes DXes (but isn't on the DXCC Honor Roll), and who exclusively works neither CW nor phone.

Standard features on the Yaesu include an RF amplifier, speech processor, noise blanker, receiver and transmitter incremental tuning, peak and notch filtering, and IF passband controls.

Not bad, eh? Optional additions to the rig feature AM as well as 10-meter FM, SSB and CW filters, and an external VFO with push-button frequency input and 12 memories. And the matching speaker possesses two more audio filters for last-minute signal reception cleanup.

All of the WARC bands have been included on the transceiver, which belts 240 watts into the finals on SSB and CW below 25 MHz and 160 watts above. With the AM/FM option, the rig has a final input power of 80 watts on AM and 120 watts on FM. Frequency is, of course, PLL synthesized, and the audio quality of the transmitter may be tailored for the best intelligibility with your voice.

One of the most obvious features on the front panel of the FT-102 is the series of inset silver knobs just below the dual meters. These knobs operate the lesser-used controls such as the VOX, microphone gain, squelch, and speech compression. The knobs pop in and out so that once set, they are out of the way and will not be inadvertently readjusted. Just below the miniature controls are a series of switches which turn on the RF amplifier, noise blanker, and speech processor, and switch the crystal filters into the circuit. Standard AF/RF gain controls are provided, as are the AGC (fast and slow) and the receive preselector.

A surprising addition is the tone and clarity control, a feature too often overlooked by most other manufacturers. Nobody has ever claimed that ham radio is a hobby for audio-philos, but after four hours of 20-me-

ter cacophony or the crashing of 80 meters in the summer, my ears appreciate the small comfort a control like this offers.

Receiving

When I first turned the transceiver on, I thought it was one of the worst-sounding receivers I had ever heard. 14.32 MHz sounded like a thunderstorm in the middle of a drag race, and only the strongest signals could be pulled in with any intelligibility.

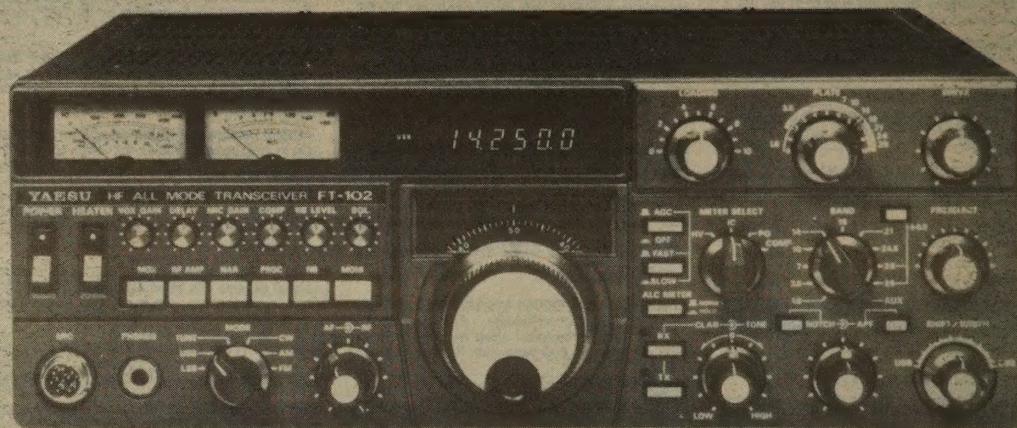
That was before I caught the note in the manual which instructs you to turn the RF amplifier off in noisy band conditions. Chalk one up for reading the instructions first. With the amp off, signals became much clearer, but the receiver still possessed fine sensitivity. As I tuned around the band, one of the first things I noticed was the sharpness of the tuning—and this was before the filters were pressed into service. Unlike some other radios, the frequency readout is no more accurate than the selectivity of the front end—what you see is what you get.

As I gained more confidence in manipulating the basic controls, I began trying out the special features. The SSB crystal filter was easy to use and it enhanced selectivity. However, signals were more difficult to tune in because of the resulting sharpness. More difficult to learn were the IF shift and bandwidth controls. These controls, located on two friction-coupled knobs at the lower left of the front panel, allow you to select the best bandwidth for the band conditions. Width, of course, narrows the passband of the IF and it is possible to reduce the adjacent QRM without losing too much of your desired signal. Once the width has been set you can vary the center frequency of the IF to focus on the signal.

When using these controls, be ready to adjust your ears to the changing sound. Together, the two controls have enough range to render unintelligible a previously clear signal.

The peak and notch controls add another level of reception manipulation, this time in the audio portion. These filters are less powerful than the IF controls and are useful in the less strenuous conditions. Although I do not know if the engineers who designed the FT-102 intended the peak and notch filters to be used in this way, I found that they conditioned the sound to be more pleasing, if not necessarily less polluted.

Overall, I found the receiver quality to be one of the best I have encountered. The toughest part of using



The Yaesu FT-102.

the receiver is hanging on to a weak signal until you can get all of the controls peaked. While trying to eliminate adjacent QRM, it is easy to mask the signal you want because of the interactive characteristic of the controls. I learned this the hard way in a QSO with a Topeka station who mysteriously disappeared. I thought it was severe QSB working in hand with QRM until I realized that I had put the IF shift on the wrong side of the signal.

Transmitting

From all reports, the FT-102 has excellent audio, due in part to the adjustments which can be made to tailor the transmitter to your voice. The first step is to cut in the monitor switch to hear your audio as others hear you. Two controls accessible through the bottom of the rig adjust high- and low-frequency attenuation. These are set-and-forget controls which need no adjustment unless you start using a different microphone or sell the rig.

The monitor function can also be used to help set the compression on the speech processor and avoid the negative effects of over-compression which void the gain derived from processing. It's no use getting an extra 5 dB if the person on the other end can't understand what you are saying. Short of having another ham tape your transmission and play it back, or using an oscilloscope, there is no better way to get your outgoing signal the way you want it. The monitor latches onto the audio in the transmitter IF so that you get a true indication of quality rather than just amplification of the microphone input.

Another useful transmitting feature is the ALC "peak hold" circuitry. The ALC meter will hold your voice peak for approximately one second to make

accurate adjustment of the mike gain control exceedingly easy.

Transmitter tune-up is a variation on the standard drive-plate-loading theme. Instead of varying the plate and loading controls simultaneously for a meter peak, the Yaesu manual recommends moving the load control up in discrete steps and adjusting the plate control until you reach a specified level on the meter.

CW fanatics will be glad to know that they can adjust the pitch of the CW sidetone to suit their taste. The FT-102 provides semi-break-in, with the VOX delay controlling T-R switching. Alternatively, the front panel MOX switch may be used, or an outboard switch may be connected to the rear-panel PTT jack. In addition, the instructions for the Yaesu include a section on how to squeeze as much juice as possible from the transmitter when operating on CW.

Accessories

Most notable among the accessories for the FT-102 is the FV-102DM external VFO. Set in a matching cabinet, the VFO expands on the capabilities of the digital circuitry of the transceiver.

The FV-102DM's five-digit display displays kilohertz with a resolution to 10 Hz, and it may be tuned with the tuning knob or by using the built-in keyboard. Scanning speed may be adjusted, or you can enter a frequency directly on the readout to move instantaneously to another frequency. The keyboard also offers a stepping rate of plus or minus 20 kHz, or plus or minus 5 kHz, and both the keyboard and the tuning knob may be disabled when operating from the frequency memory bank.

Four tuning rates may also be se-

lected for the analog control, and any of these rates may be multiplied by a factor of 10 for super-fast tuning. A series of switches allows you to put the receiver and transmitter on your choice of VFOs, or place either under the control of the stored frequencies.

A second accessory, the speaker/filter combination, offers the final word in signal conditioning. The two filters used jointly can create a speaker response suited to any environment. You can attenuate highs or lows as well as choose your bandpass width. The speaker itself has been designed for communications responsiveness and even without the filters the sound is exceptionally sharp and clear.

Finally, the manuals which accompany both the FT-102 and the accessories have been well designed. They include clear and concise operating instructions in addition to tables which outline common control positions for a variety of situations. I am also happy to report that both have extensive theory-of-operation and service sections. Although the sections are certainly far from being comprehensive service manuals, they do cover most of the maintenance and troubleshooting procedures that the average ham would need to keep operating at peak capacity.

Although some would question the need for all of the options which the FT-102 and its accompanying peripherals present, I consider them welcome additions to the shack. Good operating requires access to a variety of techniques, whether you are running a phone patch or chasing DX, and this transceiver offers the necessary flexibility for successful hamming. **RF**

Reprinted from 73 Magazine May 1983.

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- **Accessories:**
 - NC-42** 1-hour Desk Charger
 - FNB-25** 600 mAh Battery (2 watt)
 - FNB-26** 1000 mAh Battery (2 watt)
 - FNB-27** 600 mAh Battery (5 watt)
 - FBA-12** 6 AA Cell Holder
 - CSC-56** Vinyl Case w/ FNB-25
 - CSC-58** Vinyl Case w/ FNB-26/27
 - E-DC-5** 12 VDC Adaptor
 - YH-2** Headset for VOX
 - MH-12A2B** Speaker Mic
 - MH-18A2B** Lapel Speaker Mic
 - MH-19A2B** Mini Earpiece Mic
 - MH-29A2B** LCD Display Mic with Remote Functions
 - MMB-54** Mobile Mounting Hanger

"Look at this new FT-530!
Simultaneous receive on VHF
and UHF, automatic "on" timer,
82 memory channels..."

"Yaesu did it again!"



Bright minds lead to brilliant "firsts."

That's right, brilliant innovative first-time ever features which make the FT-530 our most exciting HT addition.

Exclusive break-through features, too. Like flexible in-band dual receive. Not just V/U receive. With the FT-530 you can listen to two, 2-meter signals at the same time!

Another remarkable first is the Auto On-TimerSM. Here's how it works. Choose the hour you'd like the radio to begin operating. For example, set the time for the morning, then wake up to your favorite net. What's more, the built-in 24-hour clock displays the time when the radio is off.

First out with 82 memory channels included, not an option; a real plus for storing all your favorite frequencies. With this HT, just open the box and QSO.

There's a lot of other terrific features too, such as built-in VOX and DTMF paging. And, since we know you'll find the FT-530 indispensable, we've included an automatic battery saver and voltage display – a powerful handful of exclusive features!

Be the first at your dealer's door to buy one, and the first to show off your new FT-530. What a bright idea!

Multi-Function Digital Display
Speaker Mic and S Meter. (Optional)

NEW



YAESU

Performance without compromise.SM

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Specifications subject to change without notice. Specifications guaranteed only within amateur bands. Some accessories and/or options are standard in certain areas. Check with your local Yaesu dealer for specific details.

FIND FREQUENCIES FAST !!

NEW AUTO TRIGGER & HOLD - 800% FASTER



STARTEK

INTERNATIONAL INC

ATH™ - BAR GRAPH FREQUENCY COUNTERS

Check out the **ALL NEW ATH-15 ... it's FAST !**

The **ATH-15** can ACCURATELY READ an input signal, DISPLAY the frequency and AUTOMATICALLY switch to HOLD status, in less than 8% of a second !!

- **ATH™ - AUTO TRIGGER & HOLD**
- ONE-SHOT ATH™ OPTION
- AUTOMATIC CLEAN DROPOUT
- 800% FASTER RESPONSE TIME
- ULTRA BRIGHT LED DIGITS
- MAXIMIZED SENSITIVITY < 1mV typ
- 3 to 5 HOUR NI-CADs STANDARD
- BATTERY CHARGE INDICATOR
- 4 GHZ - 2 INCH LED BAR GRAPH
- 2 RANGES - 6 FAST GATE TIMES
- 1 PPM TCXO STANDARD
- HIGH STAB 0.2PPM TCXO OPTION
- MANUAL HOLD FUNCTION
- BLANK DISPLAY FUNCTION
- 9-12V AUTO-POLARITY PWR JACK
- **StarCab™** ALUMINUM CABINET
- 1 YEAR LIMITED WARRANTY

ATH™ refers to our exclusive new AUTOMATIC TRIGGER & HOLD circuit with AUTOMATIC CLEAN DROPOUT. With **ATH™** you can say good-bye to almost all of that annoying random counting and the false readings we have become accustomed to when using portable counters. The model **ATH-15** is an ULTRA HIGH SENSITIVITY, 1 MHz to 1500 MHz frequency counter with an INTEGRATED BAR GRAPH circuit which *instantly* displays the signal strength of an input signal from < 1 MHz to over 4 GHz. When the **ATH™** feature is used, the counter displays the last readable signal received. It automatically triggers on a readable signal and automatically switches to the "hold" status when the signal disappears. Because of AUTO TRIGGERING, the first reading is correct. If the signal stops in the middle of a sample or gate time, the last complete accurate reading will be displayed and the unit switched back to "HOLD" status, hence the AUTOMATIC CLEAN DROPOUT prevents the display of erroneous data, all this is done automatically, with hands free operation - and it works great !!!

We are further responding to user requests by offering a ONE-SHOT **ATH™** option. This consists of a ONE-SHOT select switch, a push button RESET switch and two LED indicators all located on the top of the counter (not shown). When this function is used, the first readable signal that triggers the counter will be held on the display until manually reset. One push of the reset button will reset the display to zeros and enable the one-shot circuit again. The display can be blanked or turned off pending the auto triggering from an input signal, which also saves power under battery operation.

RESPONSE TIME, defined as the time from the beginning of the input signal to a stable, accurate, readable display, has been dramatically speeded up. The RESPONSE TIME is actually 800% faster than previous models and if you consider not having to manually throw the hold switch, at just the right time, the **ATH-15** is functionally the fastest counter you can buy !!



MADE IN USA

SAY GOOD-BYE
TO RANDOM
COUNTING &
FALSE READINGS

ATH-15

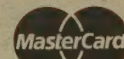
SIZE: 4"H x 3.5"W x 1"D

#ATH-15	FREQUENCY COUNTER WITH NI-CADs & 110VAC ADP	\$235.
FACTORY INSTALLED OPTIONS:		
#O/S-ATH-15	ONE-SHOT ATH™	40.
#HSTB-15	HIGH STAB TCXO 0.2ppm	100.
ACCESSORIES:		
#CC-90	BLACK VINYL ZIPPER CASE	12.
#TA-90	TELESCOPING BNC ANTENNA	12.
#P-110	PROBE, 200 MHZ, 1X-10X	39.
#M207IC	CABLE FOR MFJ-207/208	10.

CHECK IT OUT. ... BEFORE YOU BUY A COUNTER
Does Bar Graph give INSTANT readings or 3 gate times delayed?
Does Bar Graph work on every range? Over 2 GHz? With HOLD on?
Does HOLD switch CHANGE the GATE selection when turned off?
Does unit SELF-OSCILLATE - random count with no input signal?
How many switches needed to select range? Gate times per range?
How long does unit operate with batteries? One hour?
NO PROBLEM with a STARTEK POCKET COUNTER™ !!

**ALL MODELS
IN STOCK
WE SHIP
SAME DAY !**

Orders & Information
305-561-2211
Orders only
800-638-8050
FAX 305-561-9133



STARTEK INTERNATIONAL INC
398 NE 38th St., Ft. Lauderdale, FL 33334

TERMS: Shipping-handling charges for Florida add \$4 + tax, US & Canada add 5% (\$4 min - \$10 max), others add 15% of total. COD fee \$4. VISA, MC or DISCOVER accepted. Prices & specifications subject to change without notice or obligation.

STARTEK - FIRST WITH FEATURES YOU CAN USE AND FUNCTIONS THAT WORK PROPERLY. WHY SETTLE FOR LESS?

CIRCLE 247 ON READER SERVICE CARD